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THE PHYSICAL FOUNDATION OF GRENZ-RAY THERAPY[1]

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ABOUT six years ago, Dr. Gustav Bucky invited me to work with him on the investigation of the physical and clinical foundations of over-soft roentgen rays, which he had just introduced into practical use. We attempted to determine the wave lengths of the soft rays used by Dr. Bucky and to devise practical methods of measuring the quality and quantity of these rays, publishing the results in various papers, including those in the *American Journal of Roentgenology and Radium Therapy* (1), and also in Dr. Bucky's book (2).

Although considerable progress has been made in the past few years (3) in the clinical application of Grenz rays, the physical foundations have essentially remained the same. In the following presentation, therefore, some of the old data will necessarily be repeated and the few new developments will be added.

During the past few years, the name "Grenz," or border, rays has been used more and more in the literature to designate roentgen-ray beams of an average wave length of about 1.5 to 2.5 Ångströms, or of half value layers of 0.015 to 0.03 mm. of aluminum. Although from the biologic and clinical points of view the term "borderline rays" has its justification, it must be emphasized here that physically these rays form only a small part of the large spectrum of roentgen rays which has been known for many years.

GRENZ-RAY APPARATUS

A Grenz-ray apparatus is shown in Figure 1. The main transformer, the filament transformer, and the Grenz-ray tube are contained in a separate shock-proof box *(B)* which is suspended on a stand and can be easily adjusted. The tube acts as its own rectifier. The switchboard *(A)* contains the autotransformer and resistance control, a milliameter, a voltmeter, and also a water pump which forces water through the cooling device of the tube. One side of the transformer, usually that which supplies current to the water-cooled electrode, is grounded.

Well known European types of Grenz-ray apparatus are manufactured by Siemens-Reiniger-Veifa, of Berlin; Sanitas, of Berlin; Koch and Sterzel, of Dresden; Seifert, of Hamburg, and Sommer, of Vienna. These types are all practically the same, that is, the control board, the transformer, and the tube are all mounted on one easily movable stand.

GRENZ-RAY TUBES

In previous publications we described the commercial tubes (manufactured by C. H. F. Müller, of Hamburg, and by Siemens-

[1]Read by A. W. Erskine, M.D., for the author, as part of the Symposium on the Grenz Ray, before the Radiological Society of North America, at the Seventeenth Annual Meeting, at St. Louis, Nov. 30–Dec. 4, 1931.

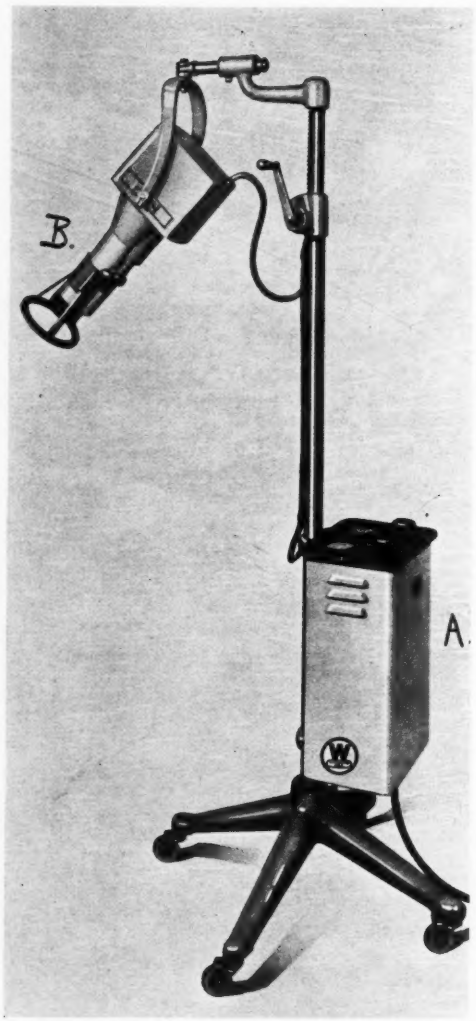

Fig. 1. Westinghouse Grenz-ray apparatus. *(A)* switchboard, *(B)* transformer and Grenz-ray tube.

Reiniger-Veifa, of Berlin), which are still in use to-day (Fig. 2, B and C). We also described a tube made entirely of lithium glass, which was constructed in the laboratories of the Cleveland Clinic Foundation. At that time we called attention to the fact that this tube did not yet compare favorably with the commercial Grenz-ray tubes, since the transmission rate of the lithium glass used by us was less than that of the Lindemann glass used in the commercial tubes. We, therefore, abandoned the construction of lithium glass tubes and turned to another method in which we attempted to avoid the use of the Lindemann window. It must be remembered that the materials of which the Lindemann window is composed, namely, boron, beryllium, and lithium, are of low atomic weight and, therefore, easily permit the transmission of very soft rays. On the other hand, the Lindemann window must be rather thin (about 0.3 mm.) and, since it is slightly hygroscopic, it is not stable. Since it deteriorates in time unless it is carefully protected by a covering of lacquer, an attempt was made to obtain the same radiation transmission with a more stable window. Following the idea of the thin glass window used by Slack in his cathode-ray tube, we built a Grenz-ray tube with the same type of window (4). The tube itself, with the exception of the window, is built on the same principles as that made by the C. H. F. Müller Company (Fig. 3). The window is a very thin bubble of glass which is drawn into a larger glass sphere. According to our tests, the filtering action is about the same as that of the Lindemann window of the Müller tube, but the glass window is more stable and does not deteriorate with time. This construction easily prevents damage to the window and also offers good resistance to the atmospheric pressure.

Shortly after the construction of our tube and the publication of our article in *Strahlentherapie*, an advertisement of the Westinghouse X-ray Company appeared in the *Journal of the American Medical Association* (June, 1931, XCVI, 7), describing a new Grenz-ray tube, built on the same principle as ours, on which scientists of the Westinghouse X-ray Company had been working independently for some time. This Westinghouse Grenz-ray tube (Fig. 4), the Siemens, and the Müller tubes are the only commercial Grenz-ray tubes on the market at the present time.

SPECTRUM OF GRENZ RAYS

Grenz rays are roentgen rays of a wave length in the neighborhood of 2 Å.U., which are produced by the special tubes just described. Because of the low potential used (around 10 K.V.), the spectrum is limited to about 1 Å.U. at the short wave end. These short wave lengths have very characteristic properties, described in detail in earlier publications (1-8), which are important in therapy and must be discussed briefly here.

As Grenz rays are extremely soft, their quality and quantity depend very much upon the thickness of the glass or Lindemann glass window, and also upon the layer of air between the tube and the skin, or measuring instrument. The spectral distribution of the Grenz-ray beam, and therewith its quality, on the one hand, will change with various thicknesses of windows and with various focal skin distances; the relative intensities of Grenz-ray beams, on the other hand, will not follow the law of inverse squares of distance.

Curves of the spectral distribution of Grenz rays produced at various voltages as calculated by Küstner (9) are shown in Figure 5. Additional spectral distributions of Grenz-ray beams have been reported elsewhere (1, 2, 6, 9). It is interesting to study the spectral distribution as well as the rapid decrease in intensity for decreasing voltages. The absorption of Grenz rays in a Lindemann window and in air can be calculated for various wave lengths by means of the following formula (9):

$$\mu \text{ air} = 0.00331\ \lambda^3 + 0.00022$$
$$\mu \text{ Lindemann} = 5.0\ \lambda^3 + 0.04$$

where μ is the coefficient of absorption and λ the wave length in Ångströms. These absorption coefficients permit the calculation of the absorption of the window and of air for various wave lengths.

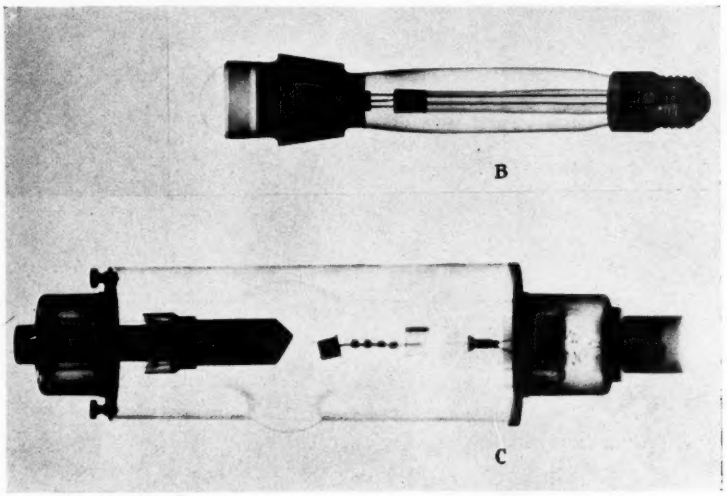

Fig. 2. *(B)* Müller Grenz-ray tube, *(C)* Siemens Grenz-ray tube.

TABLE I

	Thickness of Lindemann windows in millimeters		
K.V.	0.04	0.20	0.40
6	40.7	0.074	0.013
8	118.0	34.3	0.14
10	256.0	100.0	49.2

These data show the great influence of the thickness of the tube window and air

layers upon the qualitative and quantitative distributions of the rays. It follows, therefore, that in order to obtain a correct estimate of the quality and quantity of Grenz rays at a given point, for instance, for the application of a certain dose, it is necessary that this determination be made at the point of the application of the rays. We shall, therefore, employ the half value layer in aluminum to indicate the radiation quality, and the number of roentgen units per minute to indicate the intensity of the radiation. In addition we shall specify the kilovoltage, the milliamperage, the tube, the target material, and the focal distance.

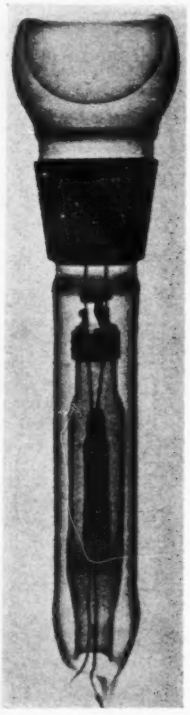

Fig. 3. Grenz-ray tube with Slack window.

DETERMINATION OF QUALITY OF GRENZ RAYS

(A) Indirect Method.—As we have just stated, it is advisable to supplement the direct method of determination of quality by the so-called indirect method, which consists in giving the secondary voltage and current and specifying the tube, target material, and focal skin distance used. The switchboards of all types of Grenz-ray

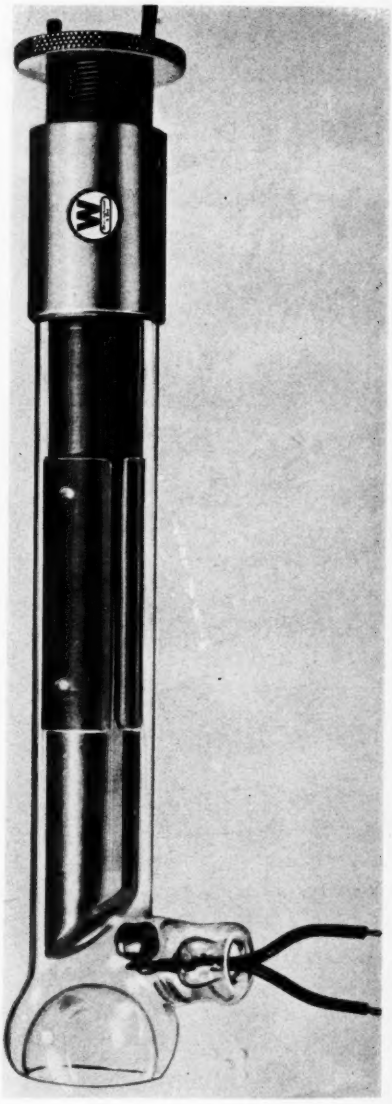

Fig. 4. Westinghouse Grenz-ray tube.

apparatus mentioned above are equipped with a kilovolt meter, that is, a voltmeter which is connected across the primary of the transformer. The voltmeters are calibrated in kilovolts in the factory by various methods. Whenever feasible, it is advisable to recalibrate these meters from time to time by means of sphere gaps or spark gaps. Better than sphere gaps are electrostatic voltmeters which are reliable and can be easily procured for the voltages used in Grenz-ray therapy. It is not sufficient, however, to connect the gap right across the terminals of the Grenz-ray tube since in practically all Grenz-ray apparatus the negative phase of the current is not suppressed. This negative phase usually is higher than that which reaches the tube and must, therefore, be excluded by means of a valve tube which must be included in the secondary circuit connected in series with the sphere gap. In order to avoid mistakes, secondary voltages should always be given in peak and not in effective voltages. The secondary current is read on a milliamperemeter which is also mounted on the switchboard of the Grenz-ray apparatus.

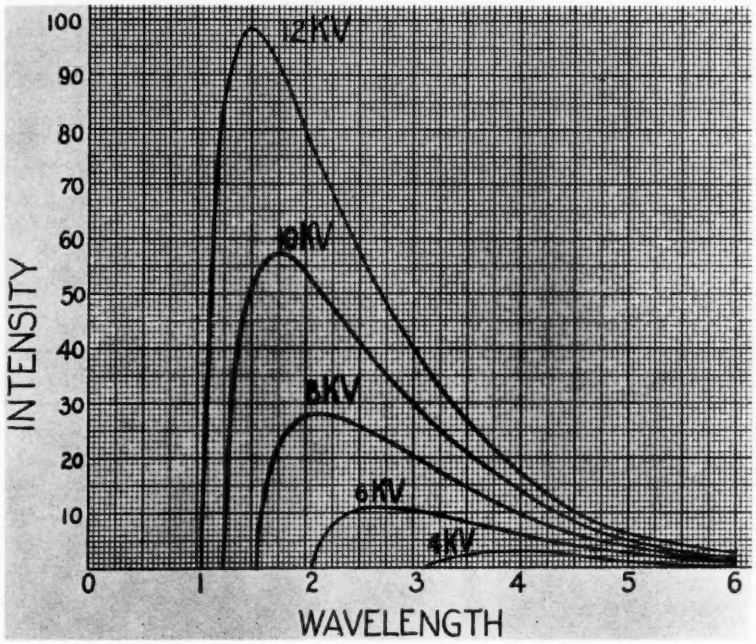

Fig. 5. Spectrum of Grenz-ray beams produced at various voltages (Küstner).

(B) Direct Method.—In addition to the data described in the preceding paragraphs it is advisable to indicate the radiation quality by direct means. A number of years ago we suggested the use of the half value layer in aluminum to specify radiation quality in Grenz-ray therapy. This half value layer can be determined satisfactorily by means of the ionization dosimeter which will be described later. In our measurements we used pure aluminum foil of 0.0125 mm. thickness as an absorbent material. Cellophane, as well as other substances, has been suggested for this purpose. We found, however, that aluminum was supe-

rior to other materials since it can be obtained in uniform thickness and does not show the variations in absorption due to impurities or irregularities in composition inherent in most other materials. Furthermore, some of the other materials are hygroscopic and, therefore, change with time.

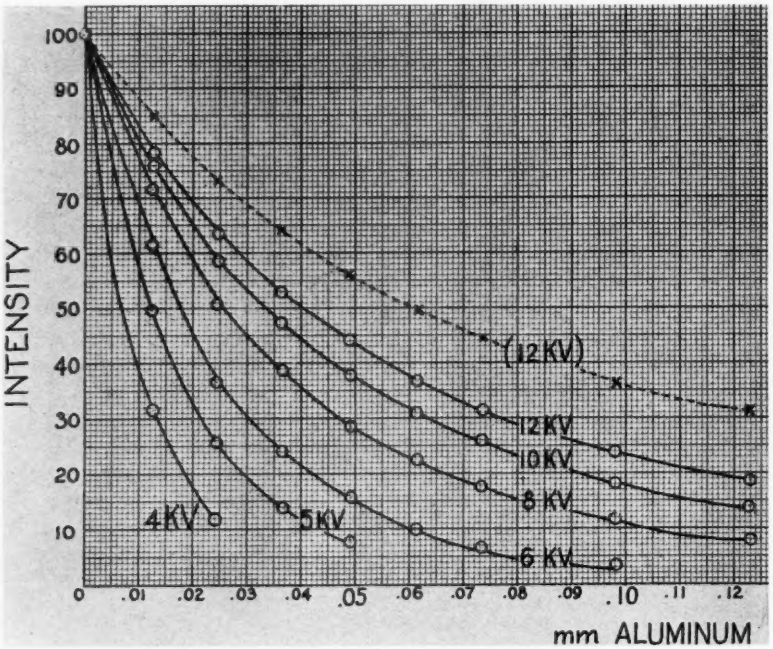

Fig. 6. Absorption curves for Grenz rays produced at various voltages.

Complete absorption curves on Grenz rays produced at various voltages have been described (1, 2), and the more important data are again reproduced (Fig. 6). The various intensities were measured with a specially constructed ionization chamber, made of goldbeater's skin and having a volume of 1 cubic centimeter. This chamber measures the radiation intensity independently of the wave lengths over the range used in Grenz-ray therapy. The curves were obtained with a Müller tube, the distance from the window to the chamber being 4 cm., that is, 9.6 cm. from the focus to the chamber. For the sake of comparison, in addition to the curves obtained with the Müller Grenz-ray tube at 4, 5, 6, 8, 10, and 12 K.V., an absorption curve is illustrated which is obtained by means of an ordinary Coolidge tube operated at 12 kilovolts. As we have stated, these curves hold only for the special tubes with which they have been measured; they may be quite different for other tubes. Furthermore, the quality distribution measured would be different if the measurements had been made at greater distances since the air would act as a filter and "harden" the Grenz-ray beams. We have previously discussed this effect and further extensive experimental data regarding it were recently presented by Meyer (10), using filters of 0.01, 0.013, 0.018, 0.025, 0.031, and 0.035 mm. aluminum and a Sie-

mens integral dosimeter with a Grenz-ray chamber. This author also called attention to the fact noticed by others (3, 6, 11) that, due to the filtering effect of the sputtered tungsten on the window of the tube, Grenz-ray tubes harden with use. For this reason, it is necessary to repeat dosage measurements on Grenz-ray tubes at least after every 100 hours of use.

It must be mentioned here that some authors believe that the half value layer method of indicating radiation quality for Grenz rays is not necessary, and that indirect factors indicating the quality are

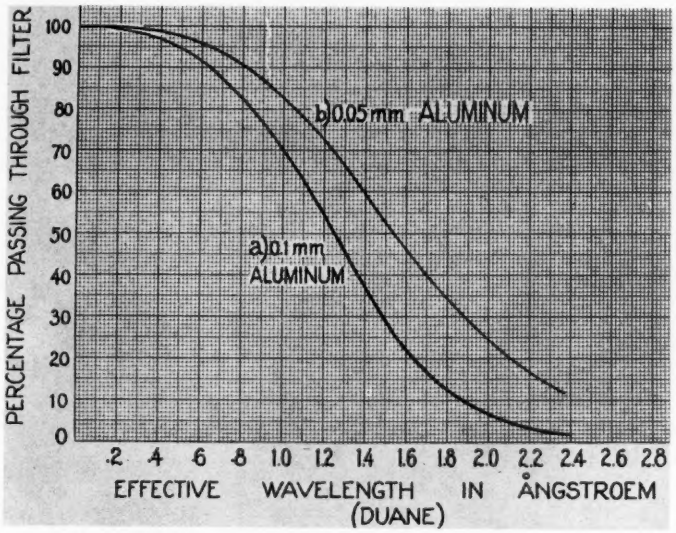

Fig. 7. Curves for the determination of the effective wave length for Grenz rays (Duane).

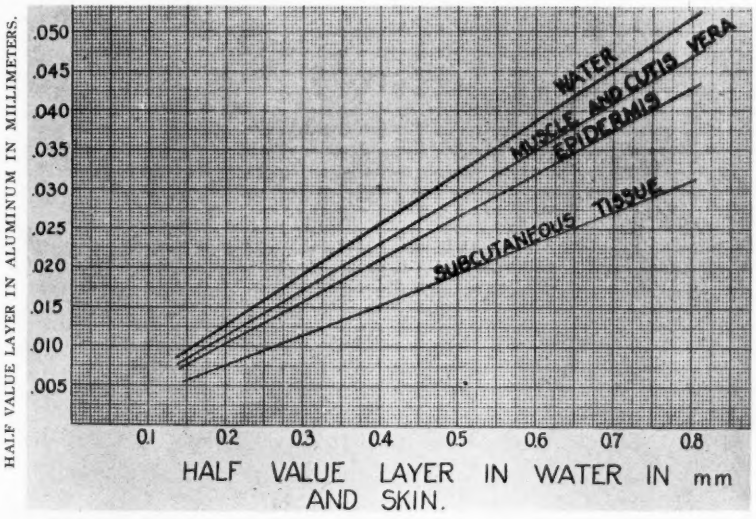

Fig. 8. Half value layer in aluminum as opposed to half value layer in water and various parts of the skin.

entirely sufficient. However, on this point opinions are divided and controversies have arisen (12).

Berger (13), who at first was against the use of the half value layer, has since constructed a practical little apparatus to measure it. The apparatus consists of an aluminum foil of 0.01 mm. thickness which can be rotated around its axis in a small cylinder, the latter being placed between the Grenz-ray tube and the ionization chamber. The Grenz rays, which first pass through a small diaphragm, must penetrate different thicknesses of aluminum foil, depending upon the angle between the foil and the path of the rays. A pointer connected to the foil permits the reading of the angle on the outside of the apparatus on a scale which is directly calibrated in respective thicknesses. In our opinion, the determination of the half value layer is indispensable in Grenz-ray therapy.

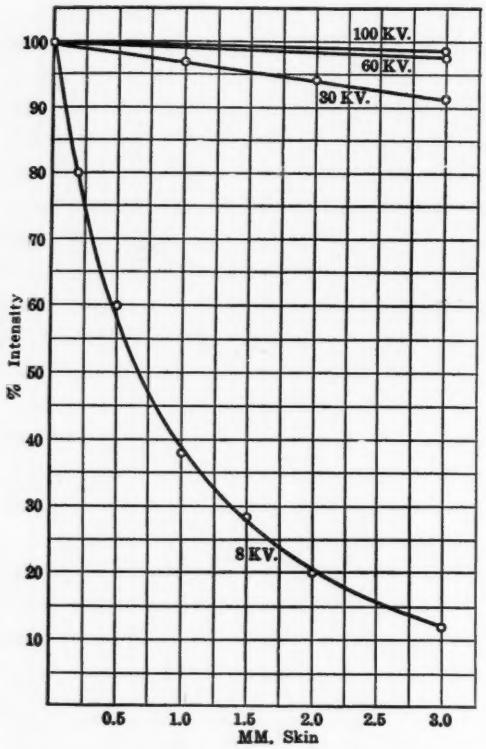

Fig. 9. Comparison of the absorption of Grenz rays and harder roentgen rays in the skin.

Another method of indicating radiation quality is the effective wave length method suggested by Duane (14). This has also been discussed previously and various data have been reported (1, 2) on the effective wave lengths of Grenz-ray beams (Fig. 7). We shall, therefore, not go into this question again, especially since, in 1931, the International Standardization Committee at the Third International Congress of Radiology suggested that the roentgen-ray beams be characterized by the half value layer.

ABSORPTION OF GRENZ RAYS IN THE HUMAN SKIN

Formerly we presented half value layers for various layers of the human skin in combination with the half value layer in water and aluminum. The most important data in this connection are contained in Table II, which gives an idea as to how far the Grenz rays of various half value layers penetrate into the skin (Fig. 8).

TABLE II.—HALF VALUE LAYER IN ALUMINUM AS COMPARED WITH HALF VALUE LAYERS IN WATER, MUSCLE, CUTIS VERA, EPIDERMIS, AND SUBCUTANEOUS TISSUE (IN MILLIMETERS)

Aluminum	Water	Muscle, cutis vera	Epidermis	Subcutaneous tissue
0.007	0.12	0.13	0.14	0.20
0.0125	0.20	0.22	0.24	0.33
0.0175	0.28	0.31	0.34	0.46
0.0250	0.39	0.43	0.47	0.64
0.0335	0.52	0.57	0.62	0.86
0.0400	0.62	0.68	0.74	1.02

It is interesting to compare the absorption of the Grenz rays in skin with that of roentgen rays usually employed in dermatology.

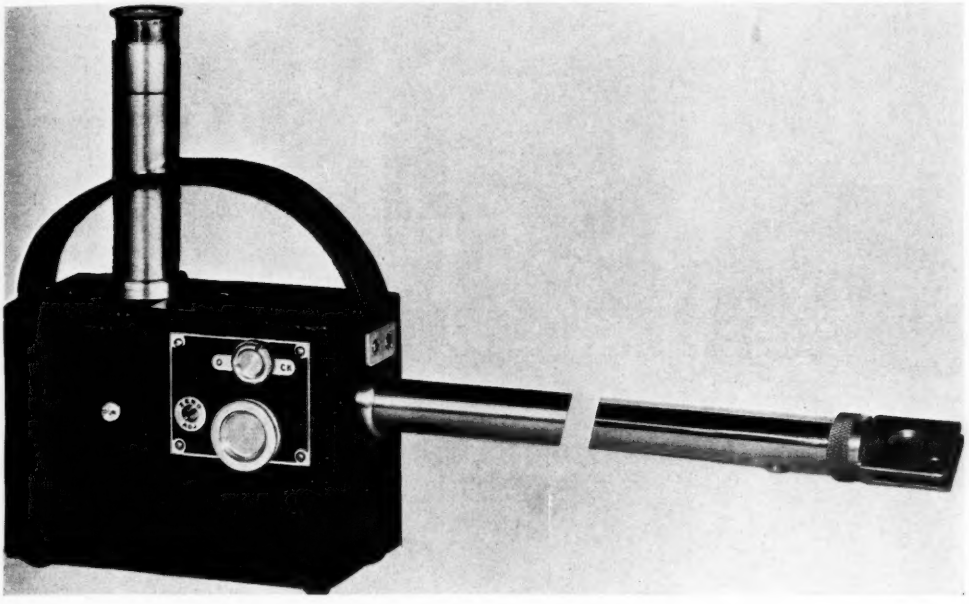

Fig. 10. Victoreen r meter with Grenz-ray chamber.

Only a very low percentage of roentgen rays produced at about 100 K.V. are absorbed by 1 mm. of skin, while over 50 per cent of Grenz rays produced at 10 K.V. are absorbed by 1 mm. of skin. This is illustrated in Figure 9, taken from Bucky's book (2).

DETERMINATION OF THE QUANTITY OF GRENZ RAYS

(A) Indirect Method.—The indirect method of measuring the quantity of Grenz rays by means of the milliamperemeter has been found to be unsatisfactory. The intensity delivered by various tubes for the same number of milliamperes varies widely. The Grenz-ray apparatus also must be calibrated at various voltages for various milliamperages, since the secondary current changes if the voltage is changed. It is, therefore, advisable always to use the same milliamperage for a given voltage. It is still better, however, to measure the quantity of radiation by the direct method at the point of application.

(B) Direct Method.—The quantity of Grenz rays is best determined by, and expressed in, the international roentgen unit, the definition of which, as well as the methods of determination, has been described frequently. A few years ago we modified our apparatus for the determination of the r unit in order to use it for the soft Grenz rays (1). Since that time we have calibrated in roentgen units specially constructed dosimeters with small ionization chambers and our calibration compares favorably with that of others. Originally we used 1 c.c. chambers built entirely of goldbeater's skin. However, we found that this construction was not stable enough for practical purposes and changed to a small metal ionization chamber with windows of goldbeater's skin (Fig. 10). It may be used in connection with any dosimeter; in the illustration, for instance, it is

connected to a Victoreen r meter. This instrument has proven to be very practical and satisfactory for dose measurements with Grenz rays as well as with roentgen rays, since the intensity of Grenz rays may be measured at the point of application of the rays.[2] Similar instruments have been constructed by Küstner, in Göttingen, by Siemens, in Berlin, and by Strauss, in Vienna.

Since it was found to be sufficiently accurate on account of its independence of the wave lengths within the range of Grenz rays for dosage measurements in Grenz-ray therapy (15), but the difficulties involved would seem to be too great to permit of accurate results. This observation is borne out by a controversy between the originators of the method and Reisner (16). Another dosage method which we have used with good success is the photometer (17). Packard (18) uses the death rate of employed, all absorption measurements described above, and the dose measurements to be described later, were made by means of our calibrated goldbeater's skin chamber.

Photographic films have been suggested

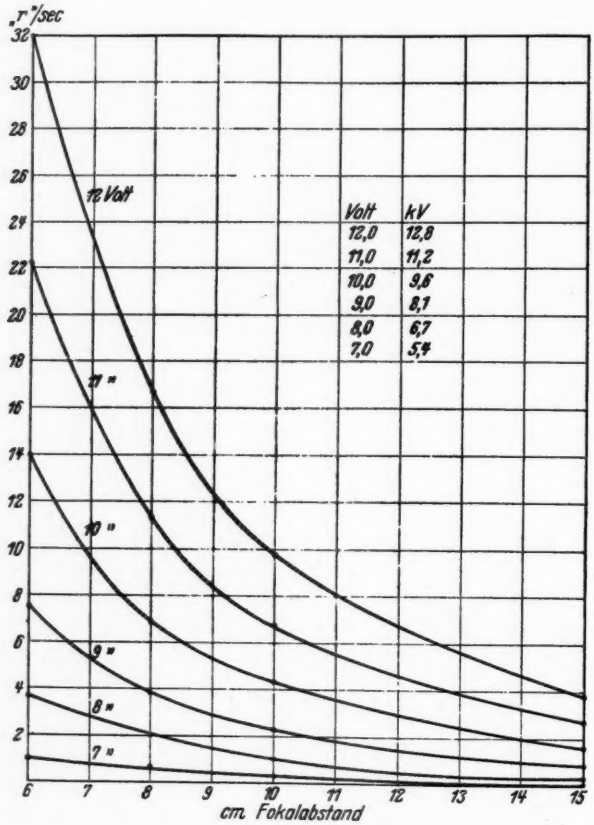

Fig. 11. Intensity of Grenz-ray beams produced at various voltages for various focal skin distances (Meyer).

[2]Courtesy of the Victoreen Instrument Company, Cleveland, Ohio.

Drosophila eggs to measure biologically the intensity of Grenz rays. Thaller (19) recently suggested a new method making use of a specially constructed photo-electric cell for the measurement of Grenz rays. In making these intensity measurements on Müller Grenz-ray tubes which have a ring-shaped focus, special precautions must be taken in order to avoid errors (20).

DOSE MEASUREMENTS ON GRENZ RAYS IN PRACTICAL USE

In his latest papers, Bucky suggests the use of Grenz rays of half value layers of 0.015 to 0.03 mm. of aluminum and focal skin distances from 6 to 15 centimeters. In Table III we have collected a series of data on Grenz-ray qualities for various conditions from which it will be seen that the

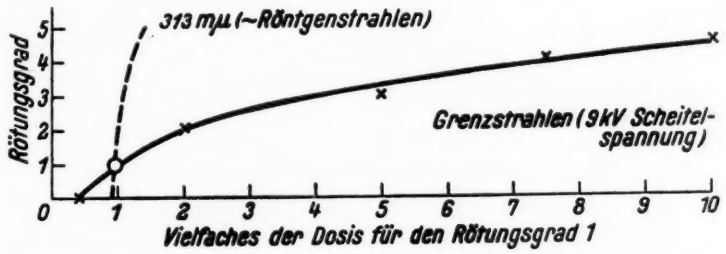

Fig. 12. Comparison of the degree of redness of the skin after application of increasing doses of roentgen rays and of Grenz rays (Hausser and Schlechter). Rötungsgrad: degree of erythema. Vielfaches der Dosis für den Rötungsgrad I: multiple of the dose to produce one degree of erythema.

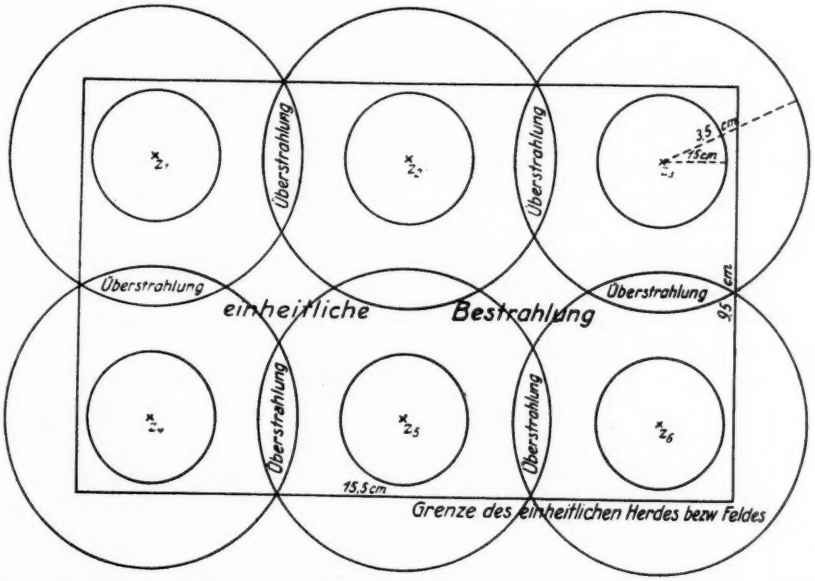

Fig. 13. Mapping out a large area of irradiation by combining various Grenz-ray beams.

qualities suggested by Bucky were produced with our tubes at voltages of from 6 to 10 kilovolts.

TABLE III.—HALF VALUE LAYER IN MILLIMETER ALUMINUM FOR GRENZ RAYS, MÜLLER TUBE, CHROMIUM IRON TARGET, 10 MILLIAMPERES

K.V.	4 cm. distance (window chamber), millimeter	20 cm. distance (window chamber), millimeter
4	0.007	.....
5	0.0125	.....
6	0.0175	0.0195
8	0.0250	0.0315
10	0.0335	0.0435
12	0.0400	0.0610

In Table IV are presented various Grenz-ray intensities in roentgen units.

Figure 11 shows more data on Grenz-ray intensities for various focal distances and various voltages as published recently (10). The data show that the intensity decreases rapidly with decreasing kilovoltage and increasing distances. We have stated previously (1, 2) that it is difficult to fix erythema doses for Grenz rays and have made the suggestion that the value of 250 r units be accepted as a threshold erythema dose. Further experiments have shown that this value is approximately correct. Hausser and Schlechter (21) presented data on measurements of erythema doses with Grenz rays as compared to erythema doses produced with roentgen rays and have shown that the increase in the biologic reaction with increasing doses is much slower for Grenz rays than for X-rays (Fig. 12). Finally, attention must be called to the difficulty in radiating larger skin areas with the ordinary type tube, since at 4 cm. distance the diameter of the irradiated area is only about 4 centimeters, and there is a marked decrease in intensity in this area from the center toward the periphery. For practical treatments careful planning (22) of the combination of various areas has to precede the treatment: for a typical case this is illustrated in Figure 13.

TABLE IV.—RADIATION INTENSITIES IN R/MIN. AND ERYTHEMA TIMES PER DOSE OF 250 r FOR DIFFERENT DISTANCES. MÜLLER TUBE, 10 MILLIAMPERES

Distance in cm. (window chamber)	6 K.V. radiation		10 K.V. radiation	
	r/min.	Erythema time in minutes for 250 r	r/min.	Erythema time in minutes for 250 r
4	47.2	5.3	396.0	0.6
6	27.6	9.0	239.0	1.0
8	18.2	13.7	162.0	1.5
10	12.7	19.7	126.0	2.0
15	5.9	42.3	66.5	3.8
20	3.2	78.0	42.5	5.9

RADIATION INTENSITIES AND ERYTHEMA TIMES PER DOSE OF 250 r FOR DIFFERENT POTENTIALS. MÜLLER TUBE, 10 MILLIAMPERES

E.m.f., K.V.	20 centimeters distance window chamber		4 centimeters distance window chamber	
	r/min.	Erythema time in minutes for 250 r	r/min.	Erythema time in minutes for 250 r
5	0.54	463.0	10.5	23.8
6	3.2	78.0	47.2	5.3
8	16.8	14.9	195.0	1.3
10	42.5	5.9	396.0	0.6
12	98.5	2.5	710.0	0.35

SUMMARY

Grenz rays are soft roentgen rays having a wave length of from 1 to 3 Ångström units. They are produced in tubes with Lindemann glass or specially constructed windows of ordinary glass with voltages of from 6 to 10 kilovolts.

High tension apparatus and tubes for the production of Grenz rays are described.

Grenz rays are so soft that they are absorbed in the window of the tube and air

to a considerable degree, therefore, only direct determinations of the radiation quality and quantity at the site of application are found to be satisfactory. These data should be accompanied preferably by an indication of the kilovoltage, the milliamperage, the type of tube, the target material, and the focal skin distance.

The absorption of Grenz rays in aluminum foil of 0.125 mm. thickness has been determined for different conditions of radiation and the half value layers of this radiation are found to be between 0.04 and 0.01 mm. of aluminum.

Data for translating half value layers of aluminum into half value layers of air, water, muscle, and various parts of the skin are given.

A small ionization chamber of goldbeater's skin, which is practical for dosage measurements in Grenz rays and is calibrated in roentgen units, is described. This chamber may be connected to any ionization dosimeter and the radiation intensity of Grenz rays may be measured independently of the wave lengths over the range used in Grenz-ray therapy. By means of this goldbeater's skin chamber the intensity of Grenz rays has been measured in r per minute for a number of radiation conditions, having been found to vary between about 400 r per minute and 0.5 r per minute.

The threshold erythema dose for Grenz rays is in the neighborhood of 250 r units. The increase of the physiologic effect of Grenz rays upon the skin with increasing dosages is much smaller than it is for roentgen rays.

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Electron Particles Again Break up into Waves.—Repetition by a modified method of the epoch-making experiments which first proved that electrons can behave as waves, has been reported by Dr. C. J. Davisson and Dr. L. H. Germer, who won fame some years ago by their pioneering experiments.

A stream of electrons moving at high speeds was directed at a nearly glancing angle towards an etched metal surface, and caught on a photographic plate where the diffraction rings formed showed that the electrons behaved like light waves. Previously untried metals and a new method devised by Prof. G. P. Thomson, of the Imperial College of Science and Technology, in London, were used in the recent experiments. Patterns of about twenty rings were obtained in the new experiments of Dr. Davisson and Dr. Germer from the metals gold, tungsten, molybdenum, cobalt, nickel, chromium, and platinum. The arrangement of the rings was characteristic of the known structure of the metals.

For some metals, etching with acid or standing in the air caused a change in the pattern.

A narrow pencil of light rays directed at a fine grating or a pencil of X-rays hitting a crystal surface produce similar "diffraction" patterns, it was explained, because of their wave-like nature.—*Science Service.*

TREATMENT OF SUPERFICIAL FUNGUS INFECTIONS WITH THE LONG WAVE LENGTH ROENTGEN RAYS (GRENZ RAYS): FURTHER OBSERVATIONS[1]

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INTRODUCTION

THE prevalence of the superficial fungus infections (ringworm) is now generally recognized, even to the extent of being accorded second place (1) in the order of incidence of the most common skin diseases. This steady increase in prevalence during the past few years has been considered by many to be apparent only because of our better knowledge of the disease, and, as a result, our greater skill in recognizing its characteristics. However, a careful survey of the statistics from various countries is rather convincing proof that this increase is actual.

The increasing recognition of the importance of the superficial fungus diseases has stimulated research and observation in all of its clinical and laboratory phases, resulting, with the exception of therapy, in numerous valuable advances. Every dermatologist in particular, and every clinician in general who treats these cases, has his own favorite remedy, with the result that innumerable drugs, almost every available therapeutic physical agency, and various combinations of different methods have met with but partial success, which has tended to reveal the refractoriness to treatment of this disease.

The rapidly accumulating literature on Grenz-ray therapy, even up to now, has failed to reveal any concerted effort in the treatment of these infections, regardless of the fact that they are primarily localized in the epidermis and that most of the radiation of Grenz rays is absorbed by the epidermis and upper layers of the derma. It was felt that, if Grenz rays offered any possibilities in dermatology, one excellent opportunity to determine their possibilities was in this particular field, and so it was decided to give Grenz-ray therapy a thorough clinical trial.

ETIOLOGIC ASPECTS

Research into the etiologic aspects of the superficial fungus infections has revealed the fact that the manifold cutaneous expressions may be the result of the action of all three classes of micro-organisms, *Hyphomycetes,* yeasts, and bacteria (2), with the yeast assuming as much importance as the others.

Efforts to classify fungi satisfactorily have resulted in considerable confusion, different workers often using different bases. Therapy has suffered as a result of this, for a simple classification based on the major morphologic characteristics might be of far greater value to the clinician and lead to better therapeutic results.

For practical purposes we have classified the fungi into two groups, namely, *Hyphomycetes* and yeast-like fungi. In the latter group, hyphæ, which usually are of the round-cell yeast structure, may be present both microscopically and in culture. This classification is used advisedly, for Draper (3) has demonstrated that the yeast forms will grow mycelia by certain changes in the media.

Predisposing factors in these fungus infections have attained a position of importance, as is reflected by the special attention given them. Hyperhidrosis is now gen-

[1]Read by Dr. M. Dorne as part of the Symposium on Grenz-ray Therapy before the Radiological Society of North America, at the Seventeenth Annual Meeting, in St. Louis, Nov. 30–Dec. 4, 1931.

erally admitted as an important predisposing factor, Levin and Silvers (4) obtaining cultures of apparently pathogenic fungi from the sweat in five of eight cases. As pre-existing intertrigo and plantar dysidrosis may predispose to infection with fungi, these possibilities must not be overlooked in therapeutic management. A much disputed point at present is the possible etiologic relationship of yeast forms in various types of dermatitis. One of us (5) has performed a series of successful inoculations of fungus cultures on their respective hosts, indicating a possible pathogenesis in the syndrome known as seborrheic dematitis, especially of the exudative type and in certain types of infantile eczema.

X-RAY RESULTS AND ATTENDANT DANGERS

Practical skin therapy with X-radiation has been developed by dermatologists such as Sabourraud, Pusey, MacKee, and others. If the radiation is judiciously applied, it is an extremely useful agent in dermatologic practice, being now considered by many as the most useful and successful single remedy available for the treatment of skin diseases. While it is true that X-radiation has proven itself almost specific in the treatment of various cutaneous disorders, it has failed almost completely in others. It cannot be considered a panacea for all skin diseases.

Superficial fungus infections have proven themselves even more refractory to irradiation than to other forms of therapy. Occasionally the infection is permanently cured; very often after the subsidence of the acute symptoms no further improvement is noted, and recurrences are common. It is more or less generally agreed that the majority of the cases will do better under intelligent antiparasitic treatment than under irradiation. Nevertheless, X-radiation is often of value as an adjuvant.

According to MacKee (6), dermatomycosis of the acute vesicular or vesicopustular and chronic intertriginous types responds much better to properly administered dermatologic treatment. While this is also true of the hyperkeratotic type, some cases do very well under fractional X-ray treatment. Fractional doses are advisable because:

(a) Inflamed tissue is hypersensitive to X-rays.

(b) The susceptibility is increased by the previous use of strong topical remedies.

(c) It has been found that, if the eruption will yield to X-rays, it will respond to small doses.

If the eruption does not disappear as a result of such treatment over a period of from four to six weeks, it is unlikely to be favorably influenced by further treatment.

Filtered radiation is not believed to be more efficacious than are unfiltered X-rays.

EXPERIENCES WITH THE GRENZ RAYS

As stated in our previous communication (7), we employed a special generator for long wave length roentgen rays, designed by the General Electric X-ray Corporation, which delivered a maximum of 12 K.V. and 12 milliamperes. This was used to activate a specially constructed modified Coolidge tube, made by Müller of Hamburg, in which the Lindemann glass window was situated on the under surface, the entire tube being encased in a metal water jacket.

With this particular apparatus, we were able, within twenty-four hours, to produce a mild red blush on the flexor surface of the forearm of a young brunette adult, employing the following factors: 8 K.V., 6 ma., 3 inch skin-tube distance, and one minute exposure.

Having determined the erythema dose with our particular apparatus (8 K.V., 6 ma., 3 in., 1 min.), we decided to use the fractional method of treatment, adopting one erythema dose as a working unit. Treatments were divided into one-quarter units, or fraction thereof, given at weekly intervals, four treatments constituting a

series. This method of procedure was decided on in view of the fact that we had limited our work to the treatment of the superficial fungus infections. We used such fractional doses at weekly intervals, so that there could hardly be any question as to the safety of the dosage. A few cases have been demonstrated by several dermatologists in which damage to the skin has been produced by erythema doses of Grenz rays. In cases in which large areas were involved, necessitating repeated focusing at each treatment, the dosage was reduced one-half. In several instances, as in the treatment of the nails, the dosage at each treatment was doubled.

In several of our patients, a single one-quarter unit exposure provoked a reaction which was manifested by an aggravation of the original lesions. In most instances these reactions subsided spontaneously within forty-eight hours with a resultant improvement in the lesions. In one instance, the reaction occurred after the second treatment, the first treatment apparently having improved the condition. As the dosage employed in the treatment of all these patients was identical, it would seem that the reactions induced were the results of individual tolerance.

In several instances following a series of treatments, there were recurrences of the original lesions. These were always milder than the original condition and responded promptly, as a rule, to the one or two additional treatments.

The first patient treated was a male, 33 years of age, who had a tinea cruris of five years' duration. The lesion disappeared entirely with one treatment of a quarter unit to each area. The next three cases failed to respond, even after three treatments had been administered. At this point in our investigation, a complete check-up of our apparatus was made, revealing the fact that our machine was functioning properly. Following this experience, it was decided that a clinical diagnosis alone was not sufficient indication for this type of treatment and routine smears (the extemporaneous potassium hydroxide preparation) and cultures (Sabourraud's dextrose media) were included in every case. As a result of this routine examination we soon learned that the cases which were positive for *Monilia* and yeast-like fungi responded with good results, while those in which the infections were of hyphomycetic origin showed very little, if any, improvement.

In our original communication (7) we reported 30 cases, to which we now wish to add 22 more. In this latter group our experience has been identical with that in the former group reported.

Two of the patients in this latter group exhibited erosio interdigitalis blastomycetica, the lesions in both instances involving the third interspace on both hands. Potassium hydroxide preparation and cultures revealed yeast. In one instance, topical applications consisting of 0.5 per cent methyl-violet aqueous solution was applied to the lesion on one hand once a week and a 0.25 unit of Grenz ray was given to the lesion on the other hand once a week. It was very interesting to note that improvement occurred in the lesions after two treatments by both methods, the improvement being somewhat more marked in the lesions treated by topical applications.

However, in this connection, the important observation was the fact that yeast was recovered from the lesions and there was a prompt response to therapy. In our original communication we reported an instance of a woman, aged 59 years, with similar lesions, in whom the potassium hydroxide preparation revealed large branching hyphæ, but cultures were negative. In this case there was no improvement after four 0.25-unit treatments with the Grenz ray and the patient thought the condition was aggravated, if anything.

Case	Age	Sex	Areas of involvement	Clinical diagnosis	Mycologic findings KOH —cultures	Treatment with Grenz rays	Clinical results
1	26	Male	Intragluteal fold	Pruritus ani	KOH and cultures +++; yeast-like fungi	0.25 unit	Cleared of symptoms in 72 hours
2	31	Male	Fingers left hand	Epidermomycosis	KOH and cultures +++; yeast	0.25 unit 0.25 unit	Cleared but recurred in 3 weeks; after further treatment cleared entirely
4	38	Female	Intragluteal fold	Pruritus ani	KOH and cultures negative	0.25 unit	No improvement; did not return.
5	31	Male	Palm of right hand; right fingers	Epidermomycosis	KOH and cultures ++; yeast-like	4—0.25	All cleared
6	30	Male	Both axillæ marked; genitocrural, slight	Epidermomycosis	KOH ++; yeast-like	3—0.25	Five months previously received 4 X-ray treatments to axilla and 2 to the genitocrural region, but with no improvement. Markedly improved after this treatment
7	26	Male	Fingers and both hands to wrists	Dermatitis venenata with secondary superimposed mycotic dermatitis	KOH ++; yeast-like	9—0.25	All cleared
8	50	Male	Fingers and hands with toxic eruption from hands on neck	Dermatitis venenata with secondary superimposed mycotic dermatitis	KOH ++; yeast	4—0.25	All cleared
13	20	Female	Scalp, face, neck, axillæ, genitocrural, lower abdomen	Seborrheic dermatitis and mycotic dermatitis	KOH ++; yeast	8—0.25 to all areas	Cleared after 3 treatments, but recurred. Additional Grenz therapy did not help much; other treatment given
14	13	Female	All fingers and both hands	Epidermomycosis	KOH ++; yeast	4—0.25	Marked improvement. Did not return
15	25	Female	Palms and index and middle fingers of the left hand	Dermatitis venenata with secondary superimposed mycotic dermatitis	KOH ++; yeast	3—0.25	All cleared
17	42	Female	Left thumb and index; right index and middle fingers	Epidermomycosis	KOH ++; yeast	3—0.25	Improved. Did not return
18	13	Female	Scalp, face, neck, arms	Seborrheic dermatitis and epidermomycosis	Repeatedly negative for fungi	7—0.25	Very marked improvement. Much treatment preceding Grenz therapy

(Continued on next page)

Case	Age	Sex	Areas of involvement	Clinical diagnosis	Mycologic findings KOH —cultures	Treatment with Grenz rays	Clinical results
21	42	Male	Feet and generalized eruption	Epidermomycosis and epidermomytid	First KOH and cultures contaminated. Later KOH and cultures +++ for yeast	7—0.25	All cleared
22	11	Female	Dorsum of toes and feet	Epidermomycosis	KOH and cultures +++ for yeast	1—0.25	Marked improvement
23	42	Female, pregnant	Toes, both feet, finger nails	Epidermomycosis	KOH and cultures +++ for yeast	2—0.25	Improved
24	40	Female	Third digital interspace of right hand	Erosio interdigitalis blastomycetica	KOH and cultures +++ yeast with fermentation	4—0.25	Markedly improved
28	14	Female	Toes of left foot	Epidermomycosis	KOH and cultures +++ for yeast	5—0.25	Entirely cleared
29	40	Female	Web between middle and ring fingers, right and left hands	Erosio interdigitalis blastomycetica	KOH and cultures +++ for yeast	3—0.25	Right hand treated with methyl-violet; left with Grenz rays. Right hand much better; both improved.
30	20	Male	Toes and feet	Epidermomycosis	KOH +++ for yeast	1—0.25	Improved
32	13	Male	Toes and feet	Epidermomycosis	KOH negative cultures +++ for yeast	2—0.25	Improved
34	24	Male	Both feet	Epidermomycosis	KOH negative cultures — *Monilia*	1—0.25	Improved
35	30	Female	Fingers	Epidermomycosis	KOH and cultures +++ for *Monilia*	2—0.25	Marked improvement
36	38	Female	Toes, left foot	Epidermomycosis	KOH and cultures negative	2—0.25	Improved

This substantiates our original observations—that good results were obtained in the patients who presented infections due to yeast-like fungi, while the infections of hyphomycetic origin showed very little, if any, improvement.

Experiences with occupational dermatoses complicated by secondary superficial fungus invasion are too meager to permit any fair evaluation at this time.

CONCLUSIONS

An experience of 22 more cases is added to a previous report of 30 patients who had dermatoses which were considered to be of superficial fungus infection and who were treated with Grenz rays used in fractional doses.

With such dosage, those infections due to yeast-like fungi responded quite uniformly to therapy, while those of hyphomycetic

origin showed very little, if any, improvement.

Further investigation is being actively pursued to determine the full worth of the above observations.

We wish to thank A. W. Stillians, M.D., and J. S. Coulter, M.D., for their many kindnesses in making it possible for us to study these cases and to have access to departmental facilities. We also wish to thank Miss Bertha Culka, who has aided us greatly by performing all of the culture work.[2]

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[2]Expenses of the fungus cultures were defrayed by Therapeutic Grant No. 143 of the American Medical Association.

Photographs Record Speedy Atomic Hearts.—World record speeds of hydrogen atomic hearts, pushed along by the pressure of 1,000,000 volts, have been photographed, investigators at the Department of Terrestrial Magnetism of the Carnegie Institution of Washington have announced to the American Physical Society. Their speed was 13,400 miles per second. The high-speed protons, as the hydrogen atom hearts are called, were allowed to plunge into a moist atmosphere in a Wilson cloud chamber and snapshots were taken of the tracks made in the cloud by the rushing atomic projectiles.

The three physicists who did the work, Dr. M. A. Tuve, Dr. L. R. Hafstad, and Odd Dahl, won the thousand-dollar prize of the American Association for the Advancement of Science, 1930-1931 meeting, for previous high voltage work.

Million-volt protons had been produced and measured by magnetic means in the same laboratory last year, but this is the first time their paths had been photographed. The speeds, of which the photographs are evidence, are the greatest yet obtained for artificially speeded protons. Protons of somewhat higher speed are produced when naturally produced alpha particles from radium are allowed to bombard paraffin. About one proton is given off for each million alpha particles. Artificial production by the Carnegie Institution method gives much larger quantities of the speedy protons than could be obtained even if large amounts of radium were used.

A high voltage tube of special design was used with a Tesla coil to produce the minute but relatively massive particles, but the three experimenters are now working with the electrostatic generator devised by Dr. R. J. Van de Graaff as a better source of even higher voltage electrical current.—*Science Service.*

GRENZ-RAY THERAPY[1]

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CREDIT is due to Bucky, who was the first to carry out systematically the idea of using roentgen rays of long wave length (Grenz rays or borderline rays) in the treatment of disease. Since he has published his good results in order to induce other clinicians to give this method a trial, many articles of a more or less critical nature have been written on the subject. An analysis of these publications must include only such papers as are based on accurate physical data, *i.e.*, definite indication of the quality and quantity of the radiation. It is also necessary to ascertain that roentgen rays of long wave length were actually used; in other words, rays produced at a potential not to exceed 10 K.V., corresponding to a half value layer in aluminum of 0.03 millimeter. If this limit is exceeded it seems quite possible that the blood vessels of the skin may undergo injury similar to that following exposure to ordinary roentgen rays, particularly if high doses were used. In that case one deprives oneself, of course, of the great advantage of long wave length therapy, namely, the lessening of the danger of late injuries.

A number of late injuries observed can in all probability be explained by this fact or are due to an inaccurate determination of the quality. It is important in this connection to mention the result of an experiment which Fuhs conducted on his own skin. He exposed an area to 4,500 r which two and one-half years later showed very fine telangiectasis in a slightly atrophic skin. The latter had been exposed, however, to sun rays rather frequently during the summer months.

We are using a half value layer of 0.02 mm. Al which is produced on our apparatus with a potential of 10 K.V. and a tube current of 10 milliamperes. The longer wave lengths in the spectrum are made useful by not exceeding the focal skin distance of 10 cm. for local treatment and 15 cm. for general body exposures. Epilation was not observed in doses up to 5,000 r, given in one sitting.

The question of the exclusive character of the biologic action of Grenz rays when compared to that of ultra-violet rays and ordinary roentgen rays has never been explained satisfactorily. Holthusen denies a fundamental difference and classifies Grenz rays with the remaining roentgen spectrum. Politzer and Zakovsky did not see any difference between the effect of Grenz rays and that of ordinary roentgen rays on the mitosis of cells. At this point I would like to refer to two observations made by Hummel. He found that Grenz rays in doses up to 10,000 r did not decompose cholesterol or its fatty acid esters in certain solutions, while ordinary roentgen rays do. Nor was an effect seen if cholesterol dissolved in blood serum was exposed to Grenz rays *in vitro*. In my own erythema tests on human skin I noticed that the first visible erythema appeared following doses of from 240 to 480 r, and that up to doses of 2,400 r and more the reaction takes its usual course. If, however, a dose of 4,800 r was applied, a very marked erythema appeared immediately which developed within three days to a pillow-like swelling, led to an intense blue-red discoloration, remained unchanged for al-

[1]Read for the author by J. N. Sisk, M.D., as part of the Symposium on Grenz-ray Therapy before the Radiological Society of North America, at the Seventeenth Annual Meeting, at St. Louis, Nov. 30–Dec. 4, 1931.

most three weeks, and developed then into pigmentation without producing blisters or ulceration. A skin area of the same size exposed to roentgen rays of short wave length (1,000 r) showed definite blistering after four weeks. This peculiar course of the erythema reaction corresponds neither to the skin reactions seen following ultraviolet exposure nor to those seen after exposure to roentgen rays of short wave length. The former usually disappear much more quickly, while the latter reach their maximum much later or, if they appear immediately, soon lead to blistering or ulceration. A therapeutic effect of Grenz rays on rickets was not observed (Rominger).

From a theoretic standpoint, there are two points of advantage in the treatment of skin diseases by roentgen rays of long wave length. One is the almost complete absorption in the upper layers of the skin which has been proved by absorption measurements; the other is the protection of the deeper layers of the tissue. In addition, there is also the wide margin of safety between the therapeutically effective dose and the injuring dose, which decreases with increasing wave length. In a series of cases of eczema and neurodermatosis in which the lesions were symmetric, we carried out the treatment by exposing one side to Grenz rays and the other side to ordinary roentgen rays. While in the overwhelming majority we saw, in accordance with the observations of Fuhs and Konrad, Spiethoff, and others, an even regression, sometimes there was a preponderance of the effect of Grenz rays. Our single doses very seldom exceeded 240 r and we usually did not have to apply more than 480 or 720 r as a total dose (measured in air). The same can be said in regard to skin diseases during childhood. Rominger states that the universal dry types of eczema, accompanied by considerable pruritus, are the field for Grenz-ray treatment. In all exudative and crustal types of eczema of the head and face, improvement was seen following Grenz-ray therapy. Psoriasis responds in the same manner as it does following ordinary roentgen therapy; in view of the great absorption of Grenz rays it is absolutely necessary to remove the scales before the exposure. The advantage of Grenz rays in this disease lies in the fact that relatively large areas of the skin can be irradiated without danger, while, if ordinary roentgen rays are used, the possibility of a blood injury increases with the number of exposed fields.

Even if we assume equal therapeutic effects of Grenz rays and ordinary roentgen rays, preference should be given to the former because of the protection of the deeper non-diseased tissue. It is for this reason that Grenz-ray therapy is so suitable for the treatment of skin lesions of the scalp, of the lids, of the scrotum, and of the cheeks.

Another type of skin lesion yielding well to Grenz-ray therapy is the dilatation of superficial blood vessels. A nevus flammeus disappeared after 500 r, given during two exposures. Caution is indicated in irradiating acne rosacea in the face. After a very conservative dose of 240 r, a reddening and swelling of the face appeared immediately following irradiation and lasted about eight days, being accompanied by intense itching and burning. As in any other type of radiation therapy, it is imperative to feel one's way in order to arrive at the proper dose, and it is always advisable to start with a very small amount of radiant energy.

In tuberculous skin diseases, a heavier dosage is necessary. Most suitable for Grenz-ray therapy is the ulcerating type of erythema induratum Bazin. The publications of Spiethoff show, to judge from illustrations accompanying them, excellent results in lupus vulgaris. The doses used are sometimes extremely high, reaching 25,000 r. It seems advisable, however, to wait sev-

eral years in order to ascertain if these cases are permanently cured and if late injuries will appear. In a critique of Grenz-ray therapy one must not forget that, in ordinary roentgen therapy, it is necessary to approach the toleration of the tissue in order to obtain a therapeutic effect. On the other hand, we should remember that other treatment methods are available in lupus vulgaris, as, for instance, the Finsen light, ointments, and the ultra-violet lamp, from which permanent results can be obtained without injury to the skin.

In the treatment of carcinomatous skin lesions, Grenz-ray therapy is, in our opinion, contra-indicated. X-ray deep therapy and radium treatment lead here to excellent results in so high a percentage of cases that it does not seem justifiable to change from a long proven method to a new and apparently less effective one. Considering the rapid loss of radiant energy when Grenz rays are used, due to the high absorption, even very intense doses will not permit of homogeneous irradiation, which is essential in the successful treatment of skin carcinoma.

Excellent experimental investigations have been carried out by Krasso, Mylius, and Erggelet concerning the effect of Grenz rays on the cornea and lens. When applying the doses used in therapy no injury of the cornea or the lens could be seen even after prolonged periods of observation. When compared with roentgen or ultra-violet rays, the advantages of Grenz rays in the treatment of inflammations of the cornea are obvious. There is no danger of injury to the deeper layers of tissue in the eye and the therapeutic procedure is not only not painful but sometimes is even analgesic.

Bucky also reported good results in local skin diseases treated by general body exposure to Grenz rays. However, none of the clinicians who repeated this work has been able to confirm his claims, although one might expect results in treatment of the universal eczema with exudative diathesis which is seen in children. A regression in hypertrichiasis following general body exposure could not be brought about in our cases; this is also at variance with Bucky's statements. We have not been able so far to verify the appearance of pigmentation in cases of vitiligo of several years' duration as reported by Bucky and Buschke.

Bucky explains the results by postulating an effect of the Grenz-ray irradiation on the vegetative nervous system and also indirectly on the glands of internal secretion. Great interest was created by the communication of Bucky that polycythemia rubra was improved following general body exposure to Grenz rays; this has been confirmed recently by Schilling. It is remarkable that, while we may be certain these rays cannot reach the bone marrow, a pathologic process originating in the bone marrow and, therefore, usually treated by X-ray deep therapy, is influenced by Grenz rays. It is only possible that an indirect effect can take place *via* the change in the skin. Schilling investigated the findings of Bucky very thoroughly. He could not confirm the constancy of the leukocyte drop following Grenz-ray exposure, but, on the contrary, sometimes saw an increase of the leukocytes. Following irradiation, a definite bradycardia appeared, lasting from 20 to 25 minutes, which was interpreted as being due to a stimulation of the vagus. In patients with hypertonia of various origins there was always a definite drop in the blood pressure 30 minutes after the treatment which, however, lasted only from one to one and one-half hours. In the normal individual the blood sugar dropped; the same reaction was noted in diabetics, while patients with toxic goiter showed an increase. The basal metabolism was not influenced at all. According to the experience of this author, Grenz-ray therapy was of benefit in asthenic patients, in asthma, in polycythemia, and sometimes in toxic goiter.

It is not indicated, however, in spastic conditions of the gastro-intestinal tract or in any type of anemia. Bucky also reported good results in Grenz-ray therapy of duodenal ulcer and in gastritis, which were confirmed by Levy, Kestle, and Gertz. Most striking in these cases was the relief from pain. Bucky based this treatment of gastro-intestinal conditions on the observation that, following burns of the skin, hemorrhages in the gastro-intestinal canal are sometimes observed. It seems evident that, up to now, our knowledge of the efficacy of Grenz-ray therapy in the treatment of internal diseases is limited; it must be tried out on a large number of cases before we arrive at a conclusion.

SUMMARY

From a study of the world literature and from our own experience with X-rays of long wave length, we may sum up the present situation in this field as follows:

1. The basis for successful Grenz-ray therapy is exact dosage.

2. For the treatment of superficial skin diseases, Grenz-ray therapy offers a valuable addition to our therapeutic armamentarium.

3. While the therapeutic effect is approximately the same as that of ordinary roentgen rays, sometimes it seems slightly superior.

4. The advantage lies in the fact that the deeper layers of tissue are well protected and that the therapeutic dose can apparently be administered without danger of immediate or delayed injuries.

5. In the treatment of local disease, the value of general body exposures to Grenz rays is a very much debated problem.

6. A final judgment as to the effect of Grenz rays on internal diseases cannot be passed at the present, but further investigations in a large number of cases are necessary and seem to be worth the effort.

7. Injuries following Grenz-ray therapy can apparently be avoided if very soft rays are used and if the smallest dose required for the therapeutic result is administered.

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DISCUSSION

Dr. Rollin H. Stevens (Detroit, Mich.): It is some four or five years since we received our first Lindemann tubes, and Dr. Pohle ar-

ranged to build up an apparatus in which to generate the energy to operate them. We have treated a number of superficial skin lesions of the fungus or yeast-like type, but we did not make a microscopic diagnosis in all of these cases. While we have received very satisfactory temporary results from the Grenz ray in some of these lesions, in others we did not see very much improvement. We have made no cures whatever.

At this time, I cannot say if all of our cases were of the hyphæ mycetic type. In fact, I do not recall that at that time we made any diagnoses, microscopically, of the yeast-like type, although we studied several, but we did not find the organism. We tried the Grenz ray in psoriasis, but could not see that there was any more benefit from this wave length than from the shorter therapeutic X-rays. In fact, I might say the same thing in regard to hyphæ mycetic infections. We finally had to go back to the use of various chemicals.

It is possible that the matter brought out by Dr. Dorne can be explained on the basis of the selective action of this special band of rays. That the rays in the roentgen- and gamma-ray fields have no selective action, all acting alike, is, I think, generally conceded by most men working in those fields to-day. Dr. Brackett, of the Smithsonian Institution, is not quite convinced that this is so, being rather inclined to think that there is a selective action. However, when we get into the ultra-violet and the visible fields, we are in fields in which there is a very decidedly selective action. In the infra-red field, we see a very selective action. It is possible that in the borderline field we may have a selective action that explains some of the results which are reported from the use of Grenz rays, both locally and constitutionally.

Dr. Reisner refers to the treatment of polycythemia and some other constitutional troubles. While I have been inclined to ridicule any beneficial action from these rays in such diseases, I realize that we have to be careful in making judgments.

In treating the whole body, would not the Grenz ray, at a distance of 50 centimeters, be almost entirely absorbed by the air?

Perhaps we cannot figure on any direct depth action of the rays in the skin to account for constitutional results. We must remember that very definite constitutional results, in rickets, etc., are obtained from ultra-violet rays which do not penetrate deeply into the skin. It is just possible that there is a similar action from the Grenz rays.

Dr. Reisner stated that, in treating psoriasis, it was necessary to scrape the scales off in order to get results, because of the filtration of the scales. He mentioned 10 K.V., but throughout the paper he has not specified whether they were using 10 K.V. or less. With 8 K.V., I got enough penetration through my thumb nail to damage the matrix severely; with 10 K.V., I think the damage would have been much more serious. Certainly, using X-rays of 8 K.V., the nail did not give much protection to the matrix.

In the case of nevus flammeus, I was much surprised at the author's results with a single dose of about 240 r; however, he has not stated the size of the birth mark or the age of the child. Those factors are very important in the treatment of nevus flammeus by other methods.

When he treats lupus vulgaris with 2,500 r, he is giving a hundred times the erythema dose. I would hesitate to use that much in lupus vulgaris for fear of stimulating malignant epithelial growth.

Dr. Arthur Mutscheller (New York City): In this symposium, so much valuable material has been presented that it would be impossible to discuss each and all of the phases that have been brought out. I think, however, one point was noticeable throughout all these papers, which I believe should be clearly kept in mind for the future.

Dr. Glasser brought out the point that there is considerable difference in the various kinds of windows. Theoretically, of course, the composition of the Lindemann glass would be such that it would transmit the long wave length rays better than any other kind of glass. However, the Lindemann windows are not blown, and the thickness of these windows cannot be regulated. Rather, they

are pressed in a mould, and, usually, in order to counteract the effect of possible deterioration by moisture, these windows have been made thicker and thicker. As a result, as a medium for the transmission of X-rays or Grenz rays Lindemann glass has become less and less effective.

Some of the results described, and the doses that are used for certain effects, clearly point out that fact. Dr. Glasser found it better to use lithium glass. At the same time that Dr. Slack developed the drawn-in window, he also had, independently, the same idea and found better results could be obtained with a drawn-in thin glass window. In other words, the thinness of the window seems to be a distinct advantage over the apparently more favorable atomic composition of the Lindemann window; the constancy of the tubes with drawn-in windows is so far superior that they ought to be the type to be used exclusively in the future.

Comparison of some doses or rather some intensities that are emitted from thin window tubes and some of the tubes with Lindemann windows, shows a very striking difference. Ordinarily, with a given tube current and voltage, the radiation emitted from some of the Lindemann window tubes imported from Germany is approximately one-third of that obtained with tubes of the drawn-in window. Thus we have been measuring with 8 K.V. and 8 ma., at a distance of 10 cm., an average intensity of 350 r per minute. This is just about three times, or even more, the intensity that is ordinarily measured with any of the Lindemann window tubes.

One further point of great importance, I believe, has not been brought out in either of the two text-books now available on the subject. I am referring to that of Fuhs and Conrad and of Bucky. These writers refer to the inverse square law, and in a casual way indicate that probably the inverse square law is not obeyed by Grenz rays, failing, however, to give any specific data. Measurements we have made point out that there is a very considerable difference or divergence between the inverse square law and the actual measurements, and that these differences should be clearly kept in mind.

Just to give one example, let us assume that we designate the radiation intensity at 10 cm. distance, 8 K.V., and 8 ma. as unity. Taking 15 cm., we should theoretically have 44 per cent of that. In reality, we measure only 25 per cent. Or, going to the other extreme, at 7 cm. distance, a lesser distance, instead of measuring about twice the intensity, we are measuring 2.6 times the intensity.

It practically means that, if we use the inverse square law and work at a shorter distance, we shall over-dose, and if we are working at a longer distance, we shall under-dose. The difference, of course, is due to the absorption of the rays in the air layers. I believe, therefore, it falls upon the manufacturer of tubes to supply a correct table of radiation intensities for various distances.

There are a great many more points that could be discussed. There is in particular one: while the name "Grenz ray" is probably highly appropriate, we should not forget that these rays are still roentgen rays, and, though they appear to have a specific action of their own, that specificity is due entirely to their definite physical properties.

Furthermore, it does appear as very important that, alongside of the correct quantity dosage, the correct control of the voltage would be a very important question. For instance, the reports of the Frankfurt (Germany) laboratory, I believe, are always on 10 K.V., and it seems that even with very small doses they produce a distinct effect upon the vascular system. But if the voltage is only 2 K.V. lower, it seems that very much larger doses can be given without producing the same pronounced effects on the blood vessels.

I am merely mentioning this to point out that the control of voltage is a very important factor and if the tube voltages are properly adjusted the safety of the use of the Grenz rays is considerably increased.

Dr. Maurice Dorne (closing): In our investigations, the results obtained are not by any means conclusive. Rather, they are suggestive, and we have written these papers with the idea that probably we could stimulate more work among the radiologists, the physicists, and the dermatologists, according to the meth-

ods we have used, with the idea of not condemning unnecessarily Grenz rays or Bucky's work, until they have been given a very thorough trial.

It is true that not enough cases have been treated, nor has the time been long enough really to determine the end-result.

At the April meeting of the New York Dermatological Society, Dr. George M. MacKee presented a case of telangiectasia caused by Grenz rays, treated about three years before presentation to the Society. This has been reported in the November, 1931, issue of the *Archives of Dermatology and Syphilology*, page 926. At this same time Dr. Eller stated that he had had six similar cases which developed after three years. I believe that heavy dosage is probably the cause of these reactions. It is my impression that we are the first to concentrate on the fractional doses and I feel that it is important for us to give this a fair trial.

As to the difference of intensity varying with the distance, we noted that immediately upon starting our work. It was about ten months or a year before we actually treated anybody. We were not familiar with the apparatus, so we worked out a number of problems in an effort to determine various factors.

All our treatments are given alike for distance, in order to avoid the loss of intensity occasioned even by a difference of a fraction of an inch. We constructed a small gauge, by screwing a little plug of wood into the center of a piece of aluminum, which fit snugly against the water jacket surrounding the tube. The tip of the wood measured exactly three inches from the center of the tube. All our skin-tube distances are measured by this means.

As to the treatment of psoriasis and the removal of scales, I think the *modus operandi* is similar to the following: when Bucky and Eller first reported their cases, they included a large series of epitheliomas of the eyelids in which they got their best results. In the discussion of that paper, Dr. Pusey stated that it was his impression that the rays reduced the epithelioma, layer by layer. Shortly after this, in 1929, Herxheimer and Uhlmann, working in Germany, performed histologic examinations in a series of cases in which the patients were treated with these rays, demonstrating that the effect was limited to the epidermis and did not involve the cutis. The changes they reported occurred following small doses of the rays which, nevertheless, completely sufficed to produce therapeutic results. In the end the small doses reach the deeper layers of the skin by routine radiation. They decided that in this manner they could determine the practical boundaries of the application of this kind of ray. It is my feeling that this may, in a way, explain the question as related to psoriasis. With probably one or two exceptions, we have not attempted to treat psoriasis, and these only as a matter of setting off our routine with the fungus infections.

As to nevus flammeus, in their newly printed book on Grenz rays, Conrad and Fuhs recommend 1,000 r units at five-week intervals. Others advise even three or four times that dosage at longer intervals. These, in my estimation, are rather large doses and just the thing we are trying to avoid until we know more about the sequelæ from Grenz rays. We have just started to treat cases of this type.

Of course, there is much work to be done. Earlier I made the statement that practically every dermatologic entity—there are few exceptions—has been treated by this method by the different workers, with varying results. The impression one gains is that, in many instances, enthusiasm and over-confidence have biased the results, while in other instances prudence and ultra-conservatism have prejudiced the results.

I think that if we follow a conservative course and give the Grenz rays a good trial, they may prove to be of value.

We are continuing our work and are starting on a parallel series of treatments. The cases will all be of the superficial fungus infections. Diagnosis will be made in the same way and similar cases will be treated in parallel groupings: X-ray, Grenz ray, and ultraviolet ray. We hope to be able to add something more to the work already done.

Dr. Ernst A. Pohle (Madison, Wisconsin): I wish only to emphasize one point

which has seemed to be prominent throughout the entire discussion, namely, the importance of actually measuring the dose under the same conditions as you use for treatment. Although Dr. Mutscheller's suggestion is a good one, I would much rather see the radiologist place his ionization chamber at that distance from the focus of the tube, when he wishes to determine the surface dose, not only every 100 hours, but every 25 hours of tube life, in view of the changes apparently occurring in this type of tube.

STUDY SUGGESTS NEW LINE OF CANCER RESEARCH

A suggestion for new methods of research into the cause of cancer and of certain obscure blood diseases is one of several important lessons to be learned from a study of radium dial painters' cancer, it appears from a lengthy report on this occupational disease made by Harrison S. Martland, M.D., medical examiner of Essex County City Hospital, Newark, N. J., to the *American Journal of Cancer.*

Dr. Martland reviewed the cases of the radium dial painters, and showed that cancer does occur in radio-active persons. The cancer in these cases developed from the constant bombardment of each victim's body by the alpha particles emanating from the radium stored in her bones, he explained. This suggests new methods for producing experimental cancer. But, more important, it suggests that, since very small amounts of radium taken into the bodies of watch dial painters quickly produced cancers, the occurrence of other forms of cancer in man may be the result of much smaller amounts of radio-active substances present in the body over much longer periods of time. These amounts would be too small to measure or even to detect by present methods.

. . . . . .

Dr. Martland considers less than one-half of a microgram of radio-active substance dangerous. He emphasized in the report what an infinitesimal amount of radio-active substance is necessary to destroy life.

"A milligram of radium bromide is not much larger than a small grain of sand," he explained in this connection. "One microgram is only one-thousandth as large, is invisible, and cannot be detected by any known chemical method. It is necessary to have only ten micrograms, or one hundred thousandth of a gram, distributed over the entire skeleton to produce a horrible death years after it has been ingested.

"This is interesting when it is recalled that the fatal dose to man of the toxin produced by *Bacillus tetani* (the germ of tetanus or lockjaw), one of the most powerful soluble poisons known, is twenty-two hundredths of a milligram or about one three-hundredth of a grain," he added.—*Science Service.*

ROENTGEN THERAPY IN BONE METASTASIS OF CARCINOMA[1]

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BONE metastasis from carcinoma and its treatment have been discussed repeatedly in a general way (1, 2) and numerous case reports can be found in the literature (2, 3, 4, 5). Such publications have made it clear that bone metastasis may respond in a remarkable way to roentgen therapy and that the patient may be relieved from severe pain for relatively long periods. A more definite impression of what may be accomplished should be obtained from a report of all carcinoma patients treated for bone metastasis. In an attempt to do that we have gone over our treatment records of carcinoma of the breast, prostate, cervix and corpus uteri, and thyroid. Hypernephroma and melanoma have also been included in this survey. The records have been collected since July, 1926, when high voltage therapy was introduced at the University Hospital.

It should be kept in mind that patients seldom come to a cancer institute until the disease is far advanced. A routine procedure to discover bone metastasis has not been carried out, as a rule, as it may occur in almost any bones of the body and a complete roentgenologic study would be impracticable. The pelvis is, however, almost always examined roentgenographically in carcinoma of the prostate. Pain is the most common symptom which leads to the diagnosis of bone metastasis. In three instances the diagnosis was made in spite of the fact that the X-ray films were negative and in four others the diagnosis was made without any X-ray film. On the other hand, in some instances, metastatic bone lesions causing neither pain nor other clinical symptoms have been discovered on X-ray films. It is, therefore, evident that many patients may have had bone metastases which were never discovered.

In Table I the total number of patients who have been treated with high voltage roentgen rays is given and also the number of those with known bone metastasis. The occurrence of bone metastasis has not been expressed in percentages as the number of patients is too small to give reliable figures in this respect. The patients who are known to be dead are grouped separately; the others are referred to as alive, though some of them probably are dead by this time.

It is well known that bone metastasis in carcinoma of the prostate is very common: Table I shows that more than one-half of our patients (22 out of 38) had bone involvement. Carcinoma of the breast comes next with almost one-third of the patients (49 out of 156) in the metastatic group. Bone metastasis in carcinoma of the body and cervix of the uterus has been recorded in only 3 out of 165 patients. The occurrence seems to be more frequent in carcinoma of the thyroid (1 out of 4), in hypernephroma (5 out of 16), and in melanoma (1 out of 12). This is in agreement with the statements of other authors.

Carcinoma of the breast gave rise to both osteoclastic and osteoblastic types of metastasis in 11 cases, to osteoblastic only in 3 cases, and to osteoclastic in 30. In five cases the type was not determined. Which bones become involved seems to be mainly a matter of chance and may be seen in Table II. In comparing this table with that of W. S. Handley (7) on the frequency of carcinomatous bone metastasis, we find there is some difference. This undoubtedly

[1]Presented before the Semi-annual Meeting of the Minnesota Radiological Society, Minneapolis, Minnesota, October 25, 1930.

can be explained by the fact that his statistics were based on postmortem findings, while in this survey the metastases were substantiated by X-ray examination. Unless each bone is sectioned in an autopsy one is very apt to overlook bone metastasis; hence, many metastatic lesions may have escaped discovery. Though it seems fairly well established that carcinoma may spread to the bones through both superficial and deep lymphatic channels (4, 8), it is probable that the cells are quite often transplanted by blood (8, 9, 10). An example is seen in the patient (No. 702, Table III-A), with primary lesion in the right breast and with demonstrable metastasis limited to the left calcaneum, carpus, and ulna. Biopsy, taken of the calcaneum, showed metastatic adenocarcinoma.

Carcinoma of the prostate gave rise to both osteoblastic and osteoclastic metastasis in five patients, to osteoclastic in only one, and to osteoblastic in 16 patients. The bones involved may be seen in Table II.

Three cases of carcinoma of the cervix and body of the uterus gave rise to osteoclastic metastasis, represented in the pelvis, femur, dorsal, and lumbar spine. One case of carcinoma of the thyroid showed osteoclastic metastasis in the dorsal spine, right and left femur, and right ribs. Four hypernephroma patients had osteoclastic metastasis with irregular distribution. One patient with melanoma developed osteoclastic metastasis to a rib.

It is interesting to observe that bone metastasis sometimes occurs quite early; in some of the patients pain in one or more bones was the first symptom of metastasis anywhere in the body (10). In 14 of the patients no other metastasis was found. The time that elapsed between the operation on the primary lesion and the first treatment for bone metastasis is given in the tabulations. The shortest interval from a radical mastectomy to treatment of bone metastasis was one month and the longest interval ten years. We may conclude from this that it is apt to become noticeable almost any time, and a careful check-up of the patients is needed. The sooner the bone metastasis receives roentgen-ray treatment, the better results and the more prolonged palliation we may expect.

TREATMENTS

The treatments were carried out with high voltage, the usual factors being 200 K.V., 30 ma., 1 mm. copper plus 4 mm. aluminum filter, and 60 to 70 cm. target-skin distance. As a rule the treatments consisted of a full erythema dose (our erythema producing definite reddening and pigmentation) to the skin immediately above the involved bone. Sometimes the treatment was given at one sitting, but more often it was divided into two séances, given on the first and third day, with 10 per cent added to make up the loss in time. Sometimes the bones were irradiated from two sides and then usually in four fractional treatments. The dose given to the lesion in the bone never was less than 80 per cent or more than 120 per cent of our erythema dose. The treatments were in many instances repeated after about two months. The greatest number of series of treatments given to any one area was four.

The aim of the treatments was mainly to relieve pain and the results in this respect are shown in Column 4 of Tables III-B and IV-B, and Column 3 of Tables V-B and VI-B. The length of time the patients have been followed after treatments of bone metastasis can be found in the last column. As was to be expected, the osteoclastic type of metastasis responded to treatments much better, as a rule, than the osteoblastic type. Partial or complete relief of pain was, however, obtained in 10 cases of carcinoma of the prostate which is to be considered mainly as representing the osteoblastic type. Six of these patients had no relief and the

outcome was unknown in six. Of the other patients, representing mainly the osteoclastic group, partial or complete relief of pain was obtained in 28, no relief in one, the results were not known for 22, seven patients were not treated for the bone metastasis, and one never had any pain. The relief from pain usually came within a week after the treatment, lasting from a couple of weeks to more than one year following one series of treatments. When the records were made, an analysis of results in bone metastasis was not considered and the notes are, therefore, incomplete in this respect. It may be mentioned, for example, that a patient improved after treatments without definite reference to the bone metastasis. That is the reason the results are put down as "not known" for some of the patients.

The relief of pain is undoubtedly due to improvement of the lesion itself as has been recently pointed out by Borak (11) of Vienna. Borak emphasized the relative sensitivity of bone metastasis as compared to the primary lesion and to other metastasis, considering this due to the fact that no epithelium is present in the bone and therefore the growth changes somewhat its character. He ascribes the pain to pressure on the periosteum or nerves surrounding the bone. If epithelial tissues become involved in this region, then the resistance to radiation ought to increase and this would explain why it sometimes is very difficult to influence the growth. Borak seems to believe that often the metastatic lesion of bone is healed completely. Unfortunately X-ray films were made only exceptionally after treatment in our group of patients. The impression obtained from these was, however, that complete healing is a rather rare occurrence. In 12 cases of mainly the osteoclastic and in four cases of mainly the osteoblastic type, X-ray films were made both before and a reasonable time after treatments. Nine of the former and one of the latter showed a definite improvement. In at least one case the lesion seemed completely healed and the bone practically normal at the last X-ray examination. The patient grew worse, however, due to progression of other metastases.

When all the patients with bone metastasis are considered together, it seems that the benefit from the treatments is of rather short duration. This is in many cases due to the fact that the original lesion, as well as metastasis to glands and other organs, continued and soon brought the patient to a helpless condition, or death. In spite of this it seems that the treatments, as a rule, have been worth while. They have made it possible to reduce the use of drugs (such as morphine) and in many cases have enabled a bedridden patient to become ambulant, *e.g.*, Case No. 396. The benefit obtainable has been emphasized by some exceptionally good results.

CARCINOMA OF THE BREAST

A. T., No. 396, age 46 years. In 1923 the patient noticed a lump in the left breast. Radical amputation of the breast was performed at that time at the Mayo Clinic, following which the woman received post-operative X-ray treatment to the breast in two series there and at Aberdeen, South Dakota. One year later, at the Mayo Clinic, radium was inserted in the glands of the neck and locally to the breast. She reported to the University Hospital in December, 1927, with metastasis to the pelvis and spine. She had been unable to walk and had been confined to her bed for one month because of pain in the pelvis and hip. At this time she received a series of four treatments over the pelvis, anterior and posterior, amounting to a 120 per cent erythema dose to the tumor. She returned in March for check-up and more treatment, at which time she was able to walk and was free from pain in the pelvis. She had also gained 25

pounds in weight in four months. Between the time of admission in December, 1927, and the time of death in March, 1930 (27 months), the patient received six series of deep X-ray treatments to the pelvis, entire spine, and right shoulder girdle and was kept very comfortable as far as pain was concerned. Her physical condition kept up very well. On November 9, 1929, she fell, sustaining a pathologic fracture of the femur, and was confined to her bed. She died March 31, 1930. Information received from a sister seemed to indicate that the patient had had chest involvement and intercurrent pneumonia.

A. H., No. 69.—The patient had had a radical breast amputation in January, 1924, remaining fairly well until the Fall of 1925, when she began having pain in the right hip and back. In May, 1926, she had received a series of deep X-ray treatments at St. Barnabas Hospital, St. Louis, Mo., with resulting relief of pain. In June, 1926, she began to have severe pain in the head and neck, and X-ray films showed metastasis to the thoracic and cervical vertebræ. She was not able to move about at all except in a wheel chair. X-ray films made at the University Hospital in September, 1926, revealed multiple metastases to the pelvis, femora, lumbar, dorsal, and cervical spine, with several vertebræ almost entirely destroyed. The patient received a series of deep X-ray treatments at this time, as well as in November, 1926, with marked relief, and was able to walk about as usual and to do all her own work. After this series of X-ray treatments she entered a Christian Science Home and so gave all credit to "divine healing." She remained well until January, 1928, when she was forced to remain in bed again. She died in April, 1928 (16 months), but was faithful to Christian Science to the end.

CARCINOMA OF THE THYROID

C. D., No. 48958, age 72 years. The patient, who had had thyroid enlargement for 10 years, noticed that the gland had increased markedly in size in the 6 months preceding examination. She complained of weakness, dyspnea, and a feeling of pressure. Thyroidectomy in July, 1929, revealed a malignant melanoma. She received a series of prophylactic X-ray treatments to the neck region in July, following operation, and in January, 1930. In March, 1930, the patient developed pain in the dorsal spine. X-ray examination revealed multiple osteoclastic metastases of this region. A series of deep X-ray treatments over this region afforded relief. In June pain developed in the left hip, but was relieved by treatment. In August, she complained of pain in the right ribs and dorsal spine, receiving another course of treatment with relief. Because of pain in the pelvis, the woman is at present receiving a course of treatments in that region and has already been relieved completely. It is interesting in this case to note that the patient experienced relief within two days of the first treatment. Her physical condition is very good and there is no sign of any local or glandular recurrence (7 months).

CARCINOMA OF THE PROSTATE

C. T., No. 41166, age 66 years. Onset occurred in the latter part of May, 1927, with dysuria and dribbling. The patient became progressively worse until August, 1927, when he came to the University Hospital where his case was diagnosed as carcinoma of the prostate. He received radium implants into the prostatic gland. At this time, he complained of pain in the right femur and radiograms revealed osteoblastic metastasis to the right femur. He then received a course of deep X-ray treatments to the pelvis and the right femur, with relief of pain although the X-ray plate showed progression of the bone lesion following treatment. In November, 1929, he complained

of pain in the back, right hip, and shoulder for which he received treatment. He was given a series of treatments over the hips, pelvis, and spine at the time but his condition was not very good—he had hematuria. He has not been heard from since May, 1929 (22 months), but is undoubtedly dead.

SUMMARY

1. The records of patients treated with high voltage roentgen therapy since July, 1926, have been investigated in regard to metastatic carcinoma to the bones. A statistical survey has been made of carcinoma of the prostate, breast, thyroid, cervix and corpus uteri, and of hypernephroma and melanoma.

2. Metastases to the bones were found to be common in carcinoma of the prostate and breast. They may occur at any time and in any location and one should watch out for symptoms, especially pain, which indicate such lesions.

3. Carcinoma of the uterus and cervix does not as a rule give rise to bony metastasis but occasionally it may. Other investigators have found the incidence of bone metastasis relatively high in cases of carcinoma of the thyroid, hypernephroma, and melanoma. Our records show an agreement in this respect, though the number of patients reported is small.

4. The tables show which bones were found to be involved, the means of diagnosis used, whether metastasis was of the osteoblastic or osteoclastic type, the time interval between radical operation of the primary lesion and first treatment of bone metastasis—also between this treatment and the last time the patient was seen, number of complete treatments, and improvement of pain and of the lesion as shown by X-ray films.

5. Most of the patients, particularly those exhibiting the osteoclastic type of metastasis, benefited by the treatment. Though the improvement was of rather short duration for the group as a whole, it was quite remarkable in some few instances. It seems that the roentgen treatments have been of very definite value in reducing the amount of drugs needed for pain, in getting patients out of bed, and in restoring some of them to useful lives for as long as two years.

TABLE I

	ALIVE		DEAD		TOTAL	
	Total	Bone metastases	Total	Bone metastases	Total	Bone metastases
Prostate	28	13	10	9	38	22
Breast	104	26	52	23	156	49
Cervix	92	0	38	2	130	2
Corpus	24	0	11	1	35	1
Thyroid	3	1	1	0	4	1
Hypernephroma	12	2	4	3	16	5
Melanoma	10	1	2	0	12	1
Total	273	43	118	38	391	81

TABLE II.—FREQUENCY OF INVOLVEMENT IN THE DIFFERENT BONE REGIONS

Bones involved	Breast frequency	Prostate frequency
Spine	34	12
Pelvis	30	21
Shoulder region	4	1
Ribs and sternum	13	5
Humerus	7	
Both femurs	3	4
Either femur	14	2
Skull	6	
Knee region	1	
Calcaneum	1	
Carpus	1	
Ulna	1	
Total number of times bone regions involved	115	45

TABLE III-A.—CARCINOMA OF THE BREAST, LIVING—26 OF 104 CASES

X-ray No., Hospital No.	Name Age	Side	Bone involvement	Type	Diagnosed by	Other involvement
251 C-402	F. T. 54	R.	Right ribs, right and left clavicle, pelvis, right and left scapula, lumbar spine, right and left femora	O. and O.[2]	Pain and X-ray	Scar, local glands
317 C-455	G. K. 45	R.	Right humerus		Pain	Scar, local glands
579 45601	G. M. 42	L.	Lumbar spine, pelvis	O. and O.[2]	Pain and X-ray	Local glands
653 46847	C. S. 74	L.	Pelvis and lumbar spine, left femur	O. and O.[2]	X-ray	Scar
665 47046	S. M. 57	R.	Lumbar spine, pelvis	Osteoclast	Pain and X-ray	Liver
679 Private	A. N. 37	L.	Left scapula, pelvis, lumbar spine	Osteoclast	Pain and X-ray	Local glands
680 C-911	E. H. 43	R.	Dorsal spine, left ribs, pelvis	O. and O.[2]	Pain and X-ray	Lungs
702 51848	M. F. 69	R.	Left calcaneum, left carpus, left ulna	O. and O.[2]	Pain and X-ray	Skin, local glands
713 47926	E. B. 54	R.	Right hip, pelvis, lumbar spine	O. and O.[2]	Pain and X-ray	Local glands
724 53153	L. F. 38	L.	Dorsal spine, right humerus, pelvis	Osteoclast	Pain and X-ray	Scar
745 C-1132	B. Z. 44	R.	Pelvis and femur	Osteoclast	Pain and X-ray	Lungs, scar
857 52797	A. M. 42	R.	Right coxal bone	Osteoclast	Pain and X-ray	Scar, local glands
986 52131	A. E. 42	L.	Pelvis and lumbar spine, left femur	Osteoclast	Pain and X-ray	Axillary glands
982 51900	F. M. 52	Bilateral	Cervical and dorsal spine	Osteoclast	Pain	Scar and left side
977	C. R. 52	R.	Left ribs, pelvis, femora, spine, and skull	O. and O.[2]	Pain and X-ray	None demonstrated
1020 52490	J. M. 53	L.	Left ribs and sternum		Pain	Local glands
1038 52329	L. B. 55	R.	Pelvis, skull, sternum, right ribs, dorsal and lumbar spine	O. and O.[2]	Pain and X-ray	Supraclavicular glands
1057 92358	M. T. 47	L.	Dorsal and lumbar spine	No X-ray exam.	Pain	Local glands
1058 92359	L. B. 69	R.	Right ribs	Osteoclast	Pain and X-ray	None
1067 53471	H. J. 70	L.	Left femur, lumbar spine	Osteoclast	Pain and X-ray	None demonstrated
1109 54102	M. G. 46	Bilateral	Dorsal and lumbar spine	X-ray neg.	Pain	None demonstrated
1205	E. L. 46	R.	Pelvis, right femur, lumbar spine	Osteoclast	Pain and X-ray	None demonstrated
1142	E. F. 58	L.	Pelvis, right femur	Osteoclast	Pain and X-ray	Local glands
1195 Private	H. H. 55	L.	Right skull	Osteoclast	X-ray	Local glands
1216 55258	M. C. 37	R.	Pelvis, right femur, right ribs	Osteoclast	Pain and X-ray	Liver, local glands
1229 55530	H. G. 64	L.	Pelvis and lumbar spine	Osteoclast	Pain and X-ray	Local glands, skin, mediastinum

[2]Osteoclastic and osteoblastic

TABLE III-B.—CARCINOMA OF THE BREAST, LIVING—26 OF 104 CASES

X-ray No.	Time from operation to treatment	No. of treatments	Pain	X-ray	Time followed
251	6 years	3	Complete temporary relief	Improvement	18 months
317	2 years	3	Not known	None made	2 months
579	12 months	4	Not known	None made	
653	6 months	4	Complete temporary relief	None made	5 months
665	13 months	3	Treatment discontinued, poor condition	None made	1½ months
679	24 months	4	Complete permanent relief after each treatment	Improvement	14 months
680	14 months	2	Complete permanent relief	None made	20 months
702	9 months	5	Complete permanent relief	Fracture of calcaneum healed	8 months
713	17 months	3	Not known	None made	1 month
724	4 months	6	Complete temporary relief	No improvement	13 months
745	1 month	5	Complete temporary relief	Improvement	15 months
857	7 months	3	Not known	None made	5 months
986	3 months	4	Not known	None made	7 months
982	28 months	2	Not known	None made	
977	8 years	8	Complete temporary relief	Slight amount of repair	9 months
1020	4 years	1	Only 1 treatment due to psychosis, refused more	X-ray showed no bone metas.	1 month
1038	7 years	6	Complete permanent relief	Improvement	6 months
1057	10 months	3	No relief	None made	6 months
1058	6 years	2	Complete permanent relief		9 months
1067	2 years	2	Complete temporary relief	None made	5 months
1109	6 months	2	Complete permanent relief	None made	4 months
1205	18 months	1	Partial relief	None made	1 month
1142	2 months	2	Not known	None made	2 months
1195	2 months	1	Did not relieve; treatment to skull	None made	1 month
1216	10 days	1	Complete temporary relief	None made	3 weeks
1229	9 years	1	No pain from metastasis	None made	3 weeks

TABLE IV-A.—CARCINOMA OF THE BREAST, DEAD—23 OF 52 CASES

X-ray No. Hosp. No.	Name Age	Side	Bone involvement	Type	Diagnosed by	Other involvement
29 36541	A. V. 65	R.	Dorsal and lumbar spine, pelvis	Osteoclast	Pain and X-ray	Lungs
57 36968	M. J.	R.	Scapula, humerus, cervical spine	Not known	Pain, X-ray made outside	Local
69 37135	A. H.	R.	Entire spine, left and right femora, pelvis	Osteoclast	Pain and X-ray	None demonstrated
75 437935	S. H.	R.	Left ribs, right humerus	Osteoclast	Pain and X-ray	Liver, opposite breast
203 39435	L. B. 61	L.	Pelvis	Osteoblast	Pain and X-ray	Lungs, local glands
288 C-350	J. M. 41	L.	Left femur, lumbar spine	Osteoclast	Pain and X-ray	None demonstrated
312 41321	J. B. 36	L.	Left ribs, pelvis, right femur, and acetabulum	Osteoclast	Pain and X-ray	Lungs, skin nodules, scalp, local glands
328 41518	A. D. 63	L.	Right femur, right pelvis, lumbar and dorsal spine	Osteoclast	Pain and X-ray	None demonstrated
347 41504	D. T. 38	L.	Right femur and pelvis	Osteoclast	Pain and X-ray	Local glands
355 40614	M. J. 67	R.	Dorsal spine and multiple fractures of vertebræ	Osteoclast	Pain and X-ray	Local glands, scar
382 42208	D. B. 44	L.	Pelvis, lumbar spine, skull	Osteoblast	Pain and X-ray	Lungs and brain
396 42588	A. T. 46	L.	Dorsal spine and pelvis (bedridden)	O. and O.[2]	Pain and X-ray	None demonstrated
411 42856	M. H. 37	R.	Skull, dorsal spine	Osteoclast	Pain and X-ray	None demonstrated
438 43413	A. D. 62	R.	Left humerus, spine, pelvis, ribs	O. and O.[2]	Pain and X-ray	None demonstrated
594 45761	A. D. 52	R.	Lumbar spine, pelvis	O. and O.[2]	Pain and X-ray	Skin—general
606 46046	C. D. 77	R.	Right femur, spine, pelvis, ribs	Osteoclast	Pain and X-ray	Local glands
657 46994	L. O. 54	R.	Left humerus and scapula, left femur, right knee	Osteoclast	Pain and X-ray	None demonstrated
673 C-899	E. W. 62	R.	Dorsal spine	Osteoclast	Pain and X-ray	Generalized
707 47884	E. F. 44	R.	Dorsal spine, left humerus, left femur, pelvis	Osteoclast	Pain and X-ray	Liver, lungs
728 48146	B. J. 40	L.	Pelvis, sacrum, lumbar spine, right ribs	Osteoclast	Pain and X-ray	None demonstrated
754 48432	M. D. 46	R.	Dorsal and cervical spine, skull	Osteoclast	Pain and X-ray	Lungs
1210 55247	H. D. 42	R.	Cervical and lumbar spine, pelvis	Osteoblast	Pain and X-ray	None demonstrated
746	J. W. 42	L.	Right ribs		Pain—X-ray neg.	General

TABLE IV-B.—CARCINOMA OF THE BREAST, DEAD—23 OF 52 CASES

X-ray No.	Time from operation to X-ray treatment	Number of treatments	Pain	X-ray	Time followed
29	10 years	3	Complete temporary relief	None made	Died 6 months
57	4 years	1	No treatment given to bones	None made	10½ months
69	2 years	2	Patient able to walk again (Christian Scientist)	None made	16 months
75	7 years	6	Partial temporary relief	Extension	16 months
203	6 months	4	No treatment given to bones	None made	4 months
288	1½ years	5	Complete temporary relief	Improvement	6 months
312	1 year	1	Partial temporary relief	None made	½ month
328	Lump in breast one year	1	Complete temporary relief	None made	2 months
347	Palliative; removed immediately	1	Bones not treated	None made	1 month
355	6 months	3	Bones not treated	None made	8 months—accident
382	1 year	1	Not known	None made	2 months
396	4 years	6	Complete temporary relief—able to be up 1½ years after treatment	None made	27 months
411	Not operated on	1	Not known	None made	7 months
438	10 months	1	Not known	None made	4 months
594	4 years	1	Not known Treated outside	None made	14 months
606	2 years	1	Not known	None made	¼ month
657	2 years	2	Not known	None made	11 months
673	2 years	2	Not known	None made	7 months
707	1 year	1	Not known	None made	½ month
728	5 weeks	2	Complete permanent relief — up after 8 months in bed	None made	11 months
754	2 years	1	Not known	None made	1 month
1210	2 months	1	Partial temporary relief	None made	2 months
746	8 months	2	Not known	None made	5 months

TABLE V-A.—CARCINOMA OF THE PROSTATE, LIVING

X-ray No., Hosp. No.	Name Age	Number of treatments	Bone involvement	Type	Diagnosed by	Other involvement
307 41156	C. T. 66	4	Right femur, pelvis, right ribs	O. and O.[2]	Pain and X-ray	Abdomen
370 Private	T. B.	2	Questionable metastasis to pelvis	Osteoclast	Pain and X-ray	Inguinal glands
350 41880	C. S. 62	1	Pelvis, lumbar spine	Osteoblast	Pain and X-ray	Lungs
485 44103	F. C. 68	1	Pelvis, lumbar spine	Osteoblast	Pain and X-ray	None
674 48286	E. F. 74	2	Pelvis	Osteoblast	Pain and X-ray	None
820 49275	J. E. 55	1	Pelvis	Osteoblast	Pain and X-ray	None
921 30524	T. T. 64	1	Lumbar spine, pelvis	Osteoblast	Pain and X-ray	None
901 50285	S. O. 69	1	Pelvis, lumbar spine, femora	O. and O.[2]	Pain and X-ray	None
945 51192	C. B. 70	1	Lumbar spine and pelvis	Osteoblast	Pain and X-ray	None
941 52839	E. H. 75	5	Lumbar spine, pelvis, left ribs, left scapula, right clavicle	Osteoblast	Pain and X-ray	None
1228 55486	W. B. 67	1	Lumbar spine, pelvis, ribs	O. and O.[2]	Pain and X-ray	None
1232 55055	H. D. 64	1	Pelvis	O. and O.[2]	Pain and X-ray	None
1237 55662	J. B. 60	1	Pelvis, lumbar spine	Osteoblast	Pain and X-ray	None
			CARCINOMA OF THE PROSTATE, DEAD			
314 Private	F. K.	1	Pelvis, left femur	Osteoblast	Pain and X-ray	None
380 42268	G. B.	3	Pelvis, femora, lumbar spine	Osteoblast	Pain and X-ray	None
345 41822	P. R. 80	2	Pelvis	Osteoblast	Pain and X-ray	None
714 47740	J. C. 73	1	Pelvis	Osteoblast	Pain and X-ray	None
285 Private	A. R.	5	Pelvis	Osteoblast	Pain and X-ray	Local glands
282 40527	H. S. 65	1	Right ribs	Osteoblast	Pain and X-ray	None demonstrated
304 41145	C. P.	1	Lumbar and dorsal spine, pelvis	Osteoblast	Pain and X-ray	Lungs
566 45457	M. B. 81	1	Lumbar spine, pelvis, femora	Osteoblast	Pain and X-ray	None demonstrated
749 48394	A. O. 65	1	Pelvis, femora, ribs, lumbar and dorsal spine	O. and O.[2]	Pain and X-ray	Lungs

TABLE V-B.—CARCINOMA OF THE PROSTATE, LIVING

X-ray No.	Effect of X-ray on urinary symptoms	Pain	X-ray	Time followed
307	Increased difficulty	Partial temporary relief	Progression	22 months
370	Urinary frequency reduced, patient able to work	Permanent relief	No progression	3 months
350	Very poor condition	No relief	None made	8 months
485	Temporary partial relief	Slight relief	None made	4 months
674	Not known	Not known	None made	3 months
820	Refused full-course treatment	No relief	None made	
921	Complete temporary relief	Complete temporary relief	None made	4 months
901	Not known	Complete relief	None made	½ month
945	Not known	Not known	None made	10 days
941	Partial relief	Complete temporary relief	Progression	10 months
1228	No relief	No relief	None made	3 weeks
1232	No relief	No relief	None made	1 month
1237	Partial relief	Partial relief	None made	2 weeks
	CARCINOMA OF THE PROSTATE, DEAD			
314	Not known	Partial temporary relief	None made	8 months
380	Progression	No relief	Progressive	7 months
345	Poor condition	No relief	None made	3 months
714	Not known	Not known	None made	1 year
285	Improvement	Partial temporary relief	Progression	1 year
282	Not treated	Partial temporary relief	None made	2 months
304	Not treated	Died one week after treatment	None made	10 months
566	Not known	Not known	None made	1 month
749	Not known	Not known	None made	2 weeks

TABLE VI-A.—CASE OF MELANOMA—1 OF 12 CASES

X-ray No., Hospital No.	Name Age	Number of treatments	Bone involvement	Type	Diagnosed by	Other involvement
571 45490	M. B. 47	6	Right rib	Osteoclast	Pain and X-ray	Lung, mediastinum, axillary glands
CARCINOMA OF CERVIX AND UTERUS, DEAD—3 OF 165 CASES						
710 39506	C. B. 43	2	Dorsal and lumbar spine, femur—pathologic fracture	Osteoclast	Pain and X-ray	Adnexa
235 40000	T. R. 63	1	Left ileum, 2 years following operation	Osteoclast	Pain and X-ray	Retroperitoneal glands
495 Private	D. B. 43	1	Left innominate bone	Osteoclast	Pain and X-ray	
CASES OF HYPERNEPHROMA, LIVING—2 OF 12 CASES						
297 40481	A. J. 55	2	Skull	Osteoclast	X-ray	Lungs
768 48554	V. W. 51	3	Right humerus	Osteoclast	Pain and X-ray	Abdomen
CASES OF HYPERNEPHROMA, DEAD—3 OF 4 CASES						
71 36620	M. S.	1	Pelvis, left femur		X-ray	Lungs
469	E. C. 48	1	Dorsal spine, left ribs	Osteoclast	Pain and X-ray	Abdomen
365	P. C. 15	2	Pelvis, femora, dorsal spine, right foot, skull	Osteoclast	Pain and X-ray	Lungs
THYROID CASE, LIVING—1 OF 3 CASES						
797	C. D.	4	Dorsal spine, left femur, right ribs	Osteoclast	Pain and X-ray	None demonstrated

TABLE VI-B.—CASE OF MELANOMA—1 OF 12 CASES

X-ray No.	Effect on lesion	Pain	X-ray	Time followed
571	Temporary complete disappearance in lung	Complete temporary relief	Progression	14 months
	CARCINOMA OF THE CERVIX AND UTERUS, DEAD			
710	Complete disappearance	Not known	None made	2 years
235	Infiltrated up into abdomen	Not known	None made	10 months
495	Partial improvement	Not known	None made	1 month
	CASES OF HYPERNEPHROMA, LIVING—2 OF 12 CASES			
X-ray No.	Time from operation to treatment	Pain	X-ray	Time followed
297	3 weeks		Much improved	9 months
768	2 weeks	Complete temporary relief	None made	4 months
	CASES OF HYPERNEPHROMA, DEAD—3 OF 4 CASES			
71	None	Not known	None made	2 weeks
469	14 months	Not known	None made	1 week
365	No operation	Partial relief	Improvement	4 months
	THYROID CASE, LIVING—1 OF 3 CASES			
797	14 months	Complete temporary relief	None made	7 months

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X-RAY TREATMENT OF KELOIDAL AND HYPERTROPHIC SCARS[1]

By BENJAMIN H. SHERMAN, M.D., Hollywood, California

KELOID, first described by Alibert, is derived from two Greek words meaning "scar-form." Keloid, although it generally starts in an injured area, tends to spread from this area into the surrounding tissues in a claw-like shape. While it is a moot question as to just why it forms in one scar and not in another, some disputing that there is a so-called keloid individual, still the fact remains that keloid attacks some individuals while others who have undergone like injuries, whether from operation, burns, or what not, show no sign of this disease. There seems to be no real reason to burden the mind with the etiology of keloid, as the primary cause is unknown, aside from the fact that it is more prone to attack darker and thicker skinned individuals, the syphilitic and the tuberculous, following injury.

Burns about the mouth, eyelids, nose, neck, etc., may completely change the patient's looks or expression, generally to his detriment, and may interfere with function —this is especially true when they occur about the tear ducts or angles of the mouth.

Hypertrophic scar and keloid have a common etiology—trauma, yet their histologic structures are far separated. Hypertrophic scars tend to proliferate, but they do not extend beyond the border of the injury, while keloids tend to grow out in claw-like formations over healthy tissue, converting it into a formidable dermatologic problem.

Pathologically, keloid is essentially a fibroma, arising out of the corium with small round cells that group themselves around the blood vessels, which, in the older keloid, become less numerous. The bundles of fibrous tissue run parallel to the long axis of the tumor; no glands, follicles, or elastic tissues are present in the growth, having been crowded out by the fibrous tissue.

There seems to be no distinction pathologically between the so-called true and false keloid, or new and old keloid, except that the cells are fewer in number in the latter and the blood vessels are somewhat atrophied.

Before beginning treatment of keloid or scars in general, better results will be obtained in all cases if one will take into consideration the following points:

1. Is syphilis a factor in this individual case?
2. Is tuberculosis a factor?
3. Does the individual have an obsession regarding this particular scar or keloid?

In the first instance it is to be insisted upon that a Wassermann be made regardless of age, social standing, or "previous condition of servitude," for obvious reasons. In the second instance these conditions in the tuberculous yield much less rapidly to treatment, and in the third instance those individuals who have an obsession as to their condition are apt to multiply their troubles many fold, it being a condition of the mind rather than a deformity of import. Although it may seem very small to us, to them it is of vast importance, and if it does not yield promptly they become most discouraged and in some cases have even committed suicide. One should be very guarded in his prognosis, never promising the patient relief, but, rather, giving him hope in other ways, for it is in this obstinate type of case which it takes months sometimes to relieve that patients are apt to become discouraged and to seek other treatment.

It seems to be the opinion of the profession generally that some type of irradia-

[1]Read before the Radiological Society of North America at the Sixteenth Annual Meeting, at Los Angeles, California, Dec. 1–5, 1930.

tion, together with surgery, in selected cases, is the treatment of choice for hypertrophic scar and keloid.

Keloid, like scar tissue, arises from the corium and, also like scar tissue, is generally due to trauma. It has a predilection for certain portions of the body, the region of the sternum being most frequently infested. Next in order come the lobes of the ears and in those individuals who are susceptible to this scourge it may come anywhere that trauma breaks the skin.

Keloid is the nightmare of the plastic surgeon. Many times when he has done a very commendable piece of remodeling he is abashed, and sometimes criticized, for a condition over which he has no control, except possibly through the use of the prophylactic dose of X-rays given prior to the operation. This procedure, which was first used by Dr. Pfahler, is useful to a degree, although nothing seems, in some instances, to stop the formation of keloid in those susceptible to it.

Dr. H. L. Updegraff, reconstructive plastic surgeon, with whom I have been associated in the treatment of these conditions, uses the pre-operative prophylactic suberythema dose more and more in his work and thinks it has decreased to a great degree the number of keloids encountered. It is our opinion that if a scar is closely watched, and at the first indication of keloid is irradiated with monthly suberythema doses over a period of three or four months, this lesion will not become large and unsightly, yielding much more rapidly than in those cases in which no check is made at all or made only when the condition has become unbearable to the patient. Of course, the more recent a keloid is, the more easily it is righted.

H. Lyons Hunt, in *American Medicine*, sums up the treatment of keloid as follows. Until the advent of roentgen rays and radium, both surgery and medicine failed miserably in producing a fair percentage of cures. Excision, thiosinamin, injection of formalin or of creosote oil, massage and pressure, introduction of digestive secretions such as bile, pancreatic juices, etc., all had their advocates but not cures, so it seems of little use to spend time in discussing this at any length. Of those pioneering in this field, William, Allen, Degravins, Pusey, Allen, Wickham, Hahn, Edwards, Taylor, and a few others did commendable work, but their technic varied and it was left to the roentgenologist to work out his own.

Of late we have used the following technic which seems to give very good results: 90 K.V., 4 ma., giving 650 r units through 1 mm. aluminum. This last is added to take care of the variation in tubes which has been worked out so nicely by Dr. A. W. Erskine, of Cedar Rapids. The dose may be repeated every month until recovery is complete or no further benefit is observed. We have been giving the equivalent of the above, but spaced out in weekly treatments, and in this way feel that we have retained patients who would otherwise have felt they were neglected. No reactions have been experienced at any time and the results have been satisfactory.

One such dose is given pre-operatively if operation is to be done and at monthly intervals, as above stated, following operation.

In those cases which are resistant to the X-ray, success has been had with the use of the water-cooled ultra-violet ray. Just what action ultra-violet has on these tissues is debatable, but the fact remains that the results are quite good, and the element of safety in its use is the factor that recommends it. In persons of the negro race, whose skin is so resistant to all forms of treatment, it can be pushed to success in cases in which other forms of treatment have failed or in which it would be unwise to push the X-ray further. Of course one must keep in mind the slowness with which

these conditions yield to any form of treatment, running as they do over a period of months. The radiologist must be sure to inform the patient that it will be months before appreciable relief can be had; and, too, the physician should not be influenced by sentiment to push the X-ray beyond the normal limits of dosage.

Radium is very acceptable for use in places inaccessible to the X-ray.

CONCLUSION

Prognosis should be guarded in every case of keloid or scar, be it ever so small or recent, being particularly cautious as regards the syphilitic type, the tuberculous, of erosions on the face, hard lesions, and lesions in the dark-skinned races.

The X-ray should not be pushed to the point of producing telangiectasis; in these instances, it would be better to use a less destructive wave length.

In the formation of scars there is a wide diversity of reactions. In some extensive injuries, whether lacerations, bruises, or burns, there are bound to be mutilating scars with contractions, while in others with the same extensive injury the deformity is surprisingly light. As a general rule, given the amount of surface involved together with depth of tissue involved, we can make a fairly accurate determination of the amount of scar tissue to be expected.

Probably the most important item in the treatment of these conditions is caution: caution in the application of whatever mode of treatment is used; fearlessness in calling upon the plastic surgeon when he is needed, for dividing responsibility may help in cases in which failure impends, and especially caution in the prognosis as it may save embarrassment later.

DISCUSSION

Dr. T. M. Burrows (Pasadena, Calif.): I think one should emphasize a point brought out by the speaker: the importance of treating the cause of the keloid as well as the keloid itself. In 200 cases of various benign and other lesions of the face which I removed with the circle knife, I noticed that scar formation was invariably associated with focal infection in the mouth or elsewhere. When these focal infections are treated successfully at the time or before the operations on the face, the scars are practically invisible. In cases having large keloids such as are found to occur in negroes, we treated the focal infections, removed the keloids surgically, and treated the wound with X-rays or radium. This method has given very good results if the accompanying focal infections have been treated successfully.

A considerable number of patients refuse to have their teeth or tonsils removed. One woman had a malignant tumor on the end of her nose which I removed with the knife but an unsightly hypertrophic scar developed. She had chronic tonsillitis. The tonsils were removed after the scar developed and the scar disappeared within four weeks after the removal of the diseased tonsils.

Another point of interest is that circular open wounds leave the smallest scars on the face, while on the neck, the wound must be closed carefully or a scar will form.

Dr. Howard L. Updegraff (Hollywood, Calif.): Keloid is the plastic surgeon's Sphinx. In spite of intensive observation and study by a great number of skilled observers, the why and wherefore of keloidal occurrence remains a mystery. It is almost a platitude that keloid occurs most frequently in the colored race. However, most of us are dealing with the white race and we see keloids entirely too often for our mental comfort.

The most efficacious means seems to be a combination of surgery and radiation. As a reconstructive surgeon, I have practically abandoned skin grafts on old keloidal bases. The surgical removal of hypertrophied scar tissue and definite keloidal growths must include all of the involved tissue—well into the subcutaneous layer.

These areas should be dressed with xeroform gauze (parresine mesh impregnated with 3 per cent ointment) cut to the size of the excised area. This should be covered with gauze

sponges, also cut to size. Then firm pressure approximating 30 mm. of mercury should be applied until the area has healed. X-ray in suberythema, one-fourth, doses every week until healing has entirely occurred offers a better result than any other method I have found to date.

DR. SHERMAN (closing): I would like to make a statement about the treatment of these conditions, which probably accounts for patients' remaining with us until results were obtained. Instead of the monthly suberythema dose, they were treated at weekly intervals, dividing the doses so that the results were equivalent. In this way, patients retained their interest and also felt that we were interested in them and doing something for them.

The massive dose, so to speak, I think is probably best applied to those small hard lesions such as are frequently seen on the face.

Surgery was used in those cases in which the lesion was large, possibly one or two inches across and five or six inches in length, and it was thought best to remove a portion of the lesion, or, if possible, all of it, leaving a small linear scar instead of the rough contour which remains many times, especially following a burn. In some of these cases in which it was possible to remove all of the keloid, irradiation was used with good results as a prophylactic measure.

Some workers report good results with the use of radium, but it is probably the best rule to use such agents as you are most accustomed to in getting the desired result; in other words, it is best to use those agents the specific action of which you understand.

Success in treating these patients will depend upon your judgment as to which agent to use, be it X-ray, radium, or surgery, alone or in combination, that will best suit the particular case.

THE X-RAY TREATMENT OF GONORRHEAL COMPLICATIONS IN MALES[1]

By FRANK LIBERSON, M.D., Roentgenologist to the United States Public Health Service Hospitals, NEW YORK CITY

THERE is little that is definite in the literature on the therapeutic value of X-radiation in gonorrheal complications. Wetterer, 1921, was probably the first to treat this subject in any comprehensive manner (1). His results in the inflammatory complications of gonorrhea—epididymitis, prostatitis, adenitis, etc.—were encouraging indeed, especially when treatment was instituted at an early date. His observations, however, were purely clinical, there being no mention made of control groups or attempt to follow up the patients after treatment to determine recurrence of the complaints or ailments. Later workers, Fried (2), 1925, Grynkraut (3), 1926, Sordello (4), 1926, Guhrauer (5), 1927, Martenstein (6), 1927, Günsberger (7), 1928, Samek (8), 1930, and Klövekorn (9), 1930, corroborated in the main Wetterer's findings, using, however, much smaller doses, as is the modern trend generally. These observations, too, lack the scientific certainty that control groups and a follow-up system assure. A review, then, of the entire literature leaves some doubt as to the exact efficacy of X-ray therapy in the individual gonorrheal complications.

The present study of the effect of filtered radiation in gonorrheal complications began in 1925 at the United States Marine Hospitals at Staten Island and New York. It was not an outgrowth of any particular aim at scientific completeness, but, rather, of a search for a more effective means of dealing with those cases refractory to the usual method of treatment at the time. After about one-half year's attack on these complications by means of X-ray with some measure of success, we began to deal similarly with the severer types of complications before they were considered refractory: to the present date we have treated, controlled, and followed up a sufficient number of cases to give us some notion of its effectiveness. This series consists of 44 cases of painful heel, 35 of gonorrheal arthritis, 20 of gonorrheal adenitis, 12 of gonorrheal epididymitis, and 8 of unyielding chronic gonorrheal urethritis, treated during the period from January, 1925, to July, 1931.

GONORRHEAL ARTHRITIS

(35 cases)

This is probably the most important complication of gonorrhea from the therapeutic point of view, especially in the severer mono-articular forms, since it is apt to be refractory to the usual treatment.

Roentgenologically, three types are commonly met with:

1. Simple arthrosis, with swelling of the peri-articular joint space or tendon sheaths, or of the joint proper, with X-ray evidence of synovitis.

2. Arthritis, in which there is slight diminution in joint space and some disuse atrophy (but no bony changes as seen by the X-ray), with or without effusion.

3. Osteo-arthritis, in which there is haziness over the joint, generalized peri-articular infiltration, diminution in joint space, and subsynovial bone absorption, with or without periosteal reaction.

In the simple arthroses (Group 1, above), the prognosis for recovery within a period of from three to four weeks is good under any form of treatment, or even without any. In those cases, no X-ray treatment

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was instituted, except when repeated tappings of the joint failed to effect a cure.

In Group 2, the arthritics, the prognosis is even better since the process is acute, the pain usually subsiding after a period of from four to six weeks under any form of therapy. X-ray treatment was used only in the polyarthritic cases, for the relief of pain.

It is in the osteo-arthritics (Group 3) that the prognosis is usually not favorable. Here the inflammatory process is chronic and refractory to treatment; the pain is severe, and lasts for months, or even a year. There is usually stimulation to the production of osteophytes at the borders of the articulating surfaces, permanently damaging the joint, so that, even with apparent cure of the ailment, recurrences are frequent. It is in this type of gonorrheal joint complication, the type that has lasted more than a period of six weeks and has not yielded to the usual measures—rest, immobilization, attack of the urethral source of infection, vaccine, foreign protein injection, intravenous potassium iodide, or baking and massage—that X-ray treatment was instituted. The results, although they did not solve the problem, appeared somewhat better than those obtained with other measures, so that for the past few years it has become the practice at these hospitals to refer the difficult cases of gonorrheal arthritis almost exclusively to the X-ray department for treatment.

Technic of Treatment.—In the arthroses and arthritides, the treatment was Type "A," namely, 125 K.V., 4 ma., 24 inch distance 0.25 mm. copper, 1 mm. aluminum, and 2 cm. of wood as filters, 20 cm. area, 30 minutes every other day, alternating the anterior with the posterior, the internal with the external surface of the joint or joints, until each surface received four exposures over a period of from five to six weeks. At the completion of the series there was faint browning of the skin in light-haired individuals.

In the osteo-arthritics the treatment was Type "B," consisting of 155 K.V., 4 ma., 24 inch distance, 0.5 mm. copper, 1 mm. aluminum, and 2 cm. of wood as filters, 30 minutes every other day, alternating the anterior with the posterior, and the internal with the external surface, until each area received four exposures over a period of from five to six weeks. At the completion of the treatment there was slight browning in brunets and definite mild erythema in blonds. In some blonds, treatment was stopped a week or so earlier on account of the erythema.

Results.—It is somewhat difficult to interpret exactly the results obtained, especially in view of the fact that the course of treatment was fully six weeks, and that *time* in itself was a very important factor in the treatment and final outcome of the disease. To obtain some notion, then, of its true efficacy, the average stay in the hospital of the 35 arthritic cases receiving X-ray treatment was compared with 35 others that had not received this treatment. Although these two groups are not strictly comparable (those receiving X-ray treatment being generally more severe), the treated cases showed an average stay of eight weeks as compared to nine weeks for the untreated. Only 3 of the 35 failed to obtain some relief from pain before the end of the second week of treatment.

Recurrence.—The tendency to recurrence was determined by communicating with all the other United States Public Health Service Hospitals with reference to re-admission at a later date of the treated cases. From the reports of 23 of these hospitals up to July, 1931, and from our own files, we find 12 recurrences in the 35 cases treated, indicating a definite tendency in that direction.

In view of the lack of specificity in the action of X-radiation on gonorrheal joints, the expense both as to personnel and apparatus necessary for this type of treatment, and the recurrences within a 5-year period

in about one-third of the cases, it is recommended that X-ray therapy be employed only in the most severe cases, or those in which alleviation of pain is the main desideratum.

GONORRHEAL PERIOSTITIS

(44 cases)

Periostitis, or spur-formation with an inflammatory soft-tissue infiltration over the spur, is the cause of the painful heel in gonorrhea. The treatment of 31 of these cases has been reported in a recent paper in the *Journal of Urology* (10).

From the roentgenologic viewpoint there are two readily distinguishable types of spurs.

The soft type, which is under 2 mm. in size, is very difficult to see on a dark X-ray film, and leaves a smooth periosteal border after resorption. It is generally found in young adults with a history of gonorrheal infection not more than one month before the appearance of the pain. The treatment suitable to this type of spur is Type "A" therapy, consisting of 125 K.V., 4 ma., 24 inch distance, 0.25 mm. copper, 1 mm. aluminum, and 2 cm. of wood as filters, one-half hour every other day, alternating the internal lateral and the external lateral with the plantar surface of the os calcis. This treatment is continued for six weeks, each surface getting one treatment a week. At the completion of the full course of treatment, there is the faintest browning of the skin in very light-skinned patients.

The other type of spur, which is over one month in developing, or recurs after operative procedures, appears radiographically as:

(1) A simple bony projection with a sharply defined, dense, soft-tissue area over the spur.

(2) An irregular bony projection with erosion posterior to it.

(3) An irregular bony projection with erosion and periosteal lipping of the plantar surface, seen also in the region of the attachment of the tendo achillis.

The treatment for this kind of spur is Type "B," consisting of 155 K.V., 4 ma., 24 inch distance, 0.5 mm. copper, 1 mm. aluminum, and 2 cm. wood as filters, one-half hour every other day, alternating the internal and external with the posterior surface of the os calcis for six weeks. At the completion of treatment there is a definite browning of the heel. In light-skinned patients we have to stop one or two weeks before the completion of a full course of treatment.

The results of the X-ray treatment of gonorrheal spurs are uniformly encouraging Of the 44 patients who had X-ray treatment to the gonorrheal heel, 41 left the hospital with no complaint referable to it. They were able to jump from a height of 30 inches and land on the heels without feeling any discomfort. The other three patients were discharged without improvement—one for disciplinary reasons after only one treatment, another, after three treatments. A third had four weeks of treatment, but left the hospital against advice before a definite erythema was produced. Of the 41 cases, one had to have two courses of treatment before he was able to stand the test of jumping from a height of 30 inches without discomfort.

Although nothing definite can be said about the *frequency of recurrence,* we can state after a perusal of our follow-up files and the reports of 23 other hospitals of the United States Public Health Service that, although 12 of the treated cases were readmitted for other conditions, not a single one who was fully treated complained of pain in the heel. One patient did have a recurrence of the pain three months after treatment, but the pain was atypical, being mostly in the tendo achillis.

These uniformly favorable results tend to show that X-ray therapy of the gonorrheal heel makes for a shorter stay in the hospital and a more permanent result than the operative treatment, which is marked by prolonged pre-operative and convalescent care, and the frequency of recurrence (11, 12).

GONORRHEAL ADENITIS (BUBO)

(20 cases)

Our 20 cases of gonorrheal bubo may be divided into three groups: 8 were in the presuppurative stage, 6 in the suppurative stage (but were not incised at the time X-ray treatment was instituted), while 6 were operated upon and were draining.

The first group (the presuppurative) was composed of cases that developed while the patient was in the hospital under treatment for posterior urethritis or some other gonorrheal complication. The X-ray treatment was Type "A," 125 K.V., 4 ma., 50 cm. distance, 0.25 mm. copper, 1 mm. aluminum, one-half hour every other day until three treatments were given (approximately two-thirds of an erythema dose). In six of these eight cases suppuration did not occur. The other two suppurated, were incised, and progressed very much like the suppurating cases.

In the second group (the suppurative, non-incised), the stay in the hospital was not shortened, the average being about 26 days, but the wounds were cleaner. The treatment here was as above, two-thirds of an erythema dose being given in a five-day period.

In the draining and incised cases, the treatment was repeated three weeks later, the results being cleaner wounds. The stay in the hospital was shortened in some cases, but lengthened in an equal number, as compared with the untreated cases. Our conclusion, then, after one year's trial, was that in cases of suppuration, with or without drainage, the value of the X-ray is insignificant. In the non-suppurative cases it has some value.

GONORRHEAL EPIDIDYMITIS

(12 cases)

In the treatment of gonorrheal epididymitis we were at first reluctant to use X-radiation because of the possible temporary sterilization that may follow its use. All the patients consented, however; some even welcomed the possibility of sterilization. The treatment consisted of 125 K.V., 4 ma., 50 cm. distance, 0.25 mm. copper, 1 mm. aluminum, every other day for three periods, alternating the front and back with the side of the epididymis (two-thirds of an erythema dose being given in five days). The treatment resulted in diminution or entire disappearance of the pain after five days, and some diminution of the swelling. The average stay in the hospital, however, was three weeks, only one or two days less than the control groups. This form of therapy was, therefore, discontinued the following year.

UNYIELDING CHRONIC URETHRITIS

(8 cases)

Although it is not strictly a complication of gonorrhea, unyielding chronic urethritis with acute exacerbations is included as one of the end-results of gonorrheal infection. The treatment consisted of two-thirds of an erythema dose given to the perineum on three alternate days, using the same technic as for epididymitis, but shielding the testes. Pain on micturition and also the discharge were diminished. On the other hand, the fact that strictures were more numerous than in the control cases led us to abandon X-radiation as a routine procedure.

SUMMARY

Deep X-ray therapy in the treatment of the various complications of gonorrhea in

119 males was studied over a period of six and one-half years, with special consideration for recurrences and for comparison with untreated control groups. In the order of efficacy, X-ray therapy appears uniformly effective in the painful heel due to periosteal spur; it has a limited field of usefulness in the treatment of refractory gonorrheal joint complications, especially for the relief of pain, but in gonorrheal epididymitis, adenitis, and urethritis the results were not significant.

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To Study Cosmic Rays with Balloon-borne Instruments.—Balloons bearing automatic recording instruments, floating free to heights hitherto unattained in such studies, are planned for the further investigation of cosmic radiation by Dr. Robert Andrews Millikan, of the California Institute of Technology. The launching place for these unmanned explorers of upper air has not been announced, except that it will be in a different latitude from that used for similar experiments in 1922, when Dr. Millikan and his colleague, Dr. I. S. Bowen, sent up recording balloons from Kelly Field, Texas.

In these tests ten years ago, one of the balloons reached a height of 15.5 kilometers, or 9.6 miles. Dr. Millikan hopes to send this year's balloons to greater heights, carrying their feather-weight equipment of recording electroscopes, barographs, and thermometers into regions where the blanket of air is far less dense and correspondingly more penetrable to the cosmic rays.

Investigations at great heights, as well as under great depths of water, have been considered of much importance in the study of cosmic radiation. With other rays, there is a difference in their penetrating power, depending on their wave length: the shorter the wave length, the "harder" and more penetrating the radiation. The same rule may be presumed to hold for cosmic rays. Dr. Millikan has stated as a result of his earlier studies that he has been able to distinguish a cosmic-ray "spectrum" of several wave lengths. Possibly the higher ascensions planned for this year will carry his instruments out into a region where they can pick up "softer" rays of greater wave length, that are stopped by the deep atmospheric blanket that surrounds the earth.—*Science Service.*

THE APPARENT THERAPEUTIC EFFECT OF THE ROENTGEN RAY UPON THE CLINICAL COURSE OF ACUTE MASTOIDITIS (PRELIMINARY REPORT)

By RAPHAEL SCHILLINGER, M.D., Brooklyn, N. Y.

THE clinical course of acute mastoiditis appears to take a turn for the better after exposure of the infected mastoid to the roentgen ray. The turn is marked by a syndrome of favorable action, characterized by a drop in temperature, absence of pain and insomnia, diminution in the amount of discharge, and a change in the character of the discharge from purulent to mucopurulent. The frequency of this observation, and the surprising regularity with which it is induced, leads one to believe that a therapeutic action is exerted by the roentgen ray upon the infected mastoid. A compilation of statistical data of cases definitely diagnosed as acute mastoiditis, both clinically and by X-ray examination, which were subsequently cured without operative interference, and of others, which were operated upon, is given in this report, as a result of which certain conclusions and recommendations are made.

LITERATURE

We fail to find any case reports in the literature, describing intentional therapeutic use of the roentgen ray in acute mastoiditis. Granger (1) mentions a favorable effect on infants who present signs of infection and occlusion, but not of softening and destruction, which effect was incidental to the making of the roentgenograms. Many of these went on to resolution and cure, which prompts Granger to believe that neither mere hazard nor coincidence was responsible.

In closing his discussion of his paper, Granger says, very significantly: "After seeing from 50 to 60 patients with mastoiditis

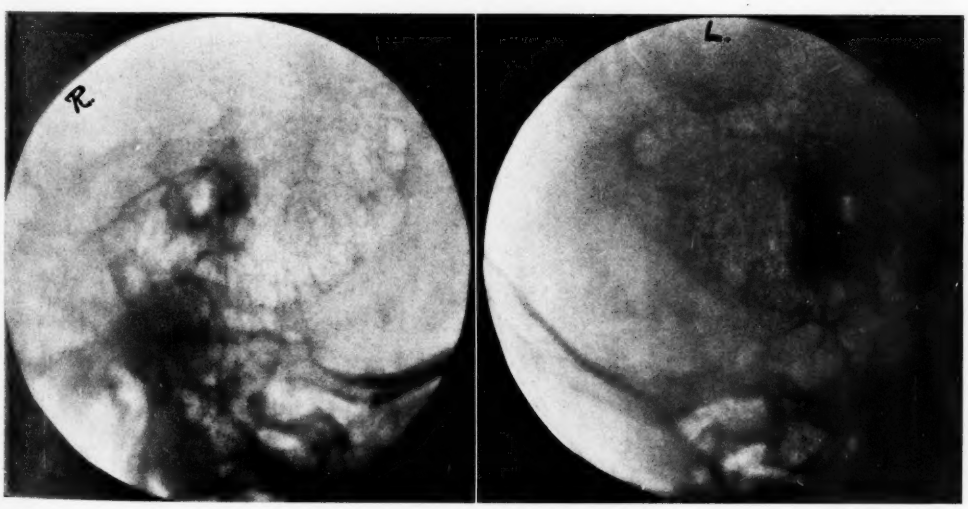

Fig. 1. Case 6, Table I.—Scarlet fever otitis media, followed by mastoiditis. The plate shows the left mastoid occluded, with softening and destruction of some trabeculæ in the posterior border cells. The ear returned to normal three weeks after the second exposure.

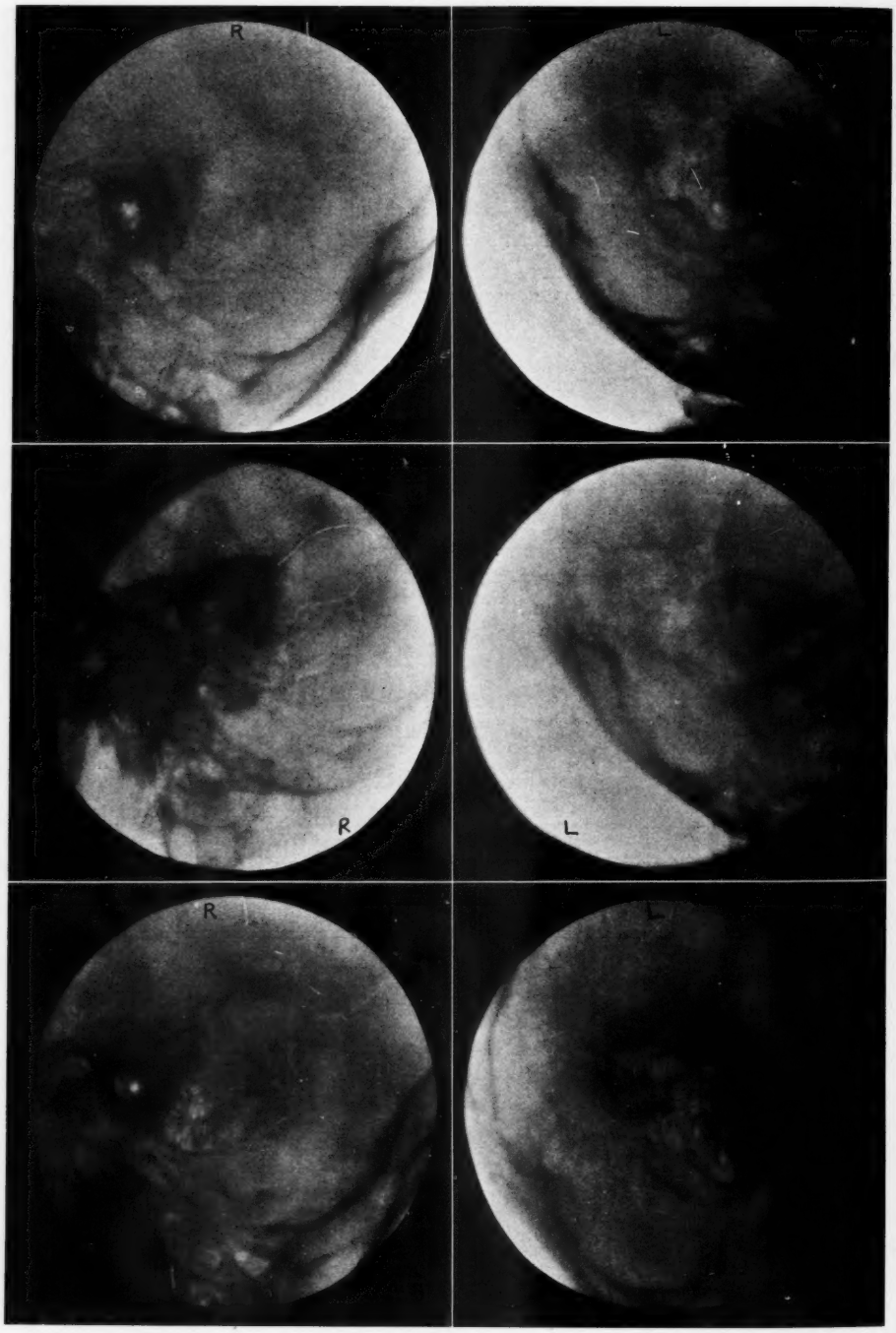

Fig. 2 *(above)*. Case 17, Table I.—Twenty-four days after incision of the drum, two large areas of coalescence in the right mastoid, peri-antral clouding, and general fuzziness were noted. A therapy dose

(Continued on next page)

was given on each of the two succeeding days and a third therapy dose was given a week later. Recovery was uneventful, function returning to normal after the second therapy dose.

Fig. 3 *(center)*. Case 17, Table I.—The two large areas of coalescence are here outlined.

Fig. 4 *(below)*. Case 17, Table I.—Twenty months later, Nature's effort at repair is quite evident. The two coalesced areas are now the site of early sclerosis. The ear is perfectly normal in function and appearance.

without bone destruction get well with fractional doses of the X-rays, one cannot feel that it is an accident."

The same author, in a previous paper (2), makes the same comment about improvement incidental to making the roentgenograms, and adds that, after a period of from two to five days of watchful waiting: "If the condition shows no sign of clearing up, or if the clinical examination indicates that it has become worse, other radiographs are made, and invariably these show signs of softening or destruction."

We are heartily in accord with the observations and statements made by Granger, who deserves much credit, more particularly because his observations are those of a radiologist and not of an otologist. From the otologist's point of view, we can add experiences similar to Granger's, and also state that, in many cases, even though softening and destruction did take place, if the clinical picture was improved by repeated X-ray exposures, postponement of operation was allowed, and eventually complete recovery without operation was made in approximately 85 per cent of our cases.

Desjardins (3) gives a very comprehensive summary of the various explanations of the mode of action of irradiation on inflammatory conditions, referring to favorable effects of the roentgen ray upon many, including otitis media. He strikes a very important note in speaking of treatment by irradiation in saying, "Even now, however, this method of treatment is not used as widely as it might be, probably because its value is not generally realized."

In the hope that this report may act as a guide and stimulus for the use of X-irradiation in acute ear infections, and more particularly for acute mastoiditis, we respectfully offer our experiences.

AUTHOR'S CONTENTION

That a certain percentage of all cases of acute mastoiditis recover without any special therapy is undoubtedly true. That a favorable effect on acute mastoiditis is exerted by the roentgen ray is also true. The use of irradiation on cases of acute mastoiditis in which operation is indicated will, in a large majority, cause resolution and cure without operation. We have observed what we believe to be a therapeutic effect on a number of cases of acute mastoiditis, even those with evidence of bone destruction, and we dared to subject some of them to repeated X-ray exposures in an effort to answer the following questions:

1. If a favorable effect on the symptoms of acute mastoiditis is seen after exposure to the roentgen ray for diagnostic purposes, could this effect be repeated by subsequent exposure, when, and if, the original symptoms recurred?

2. If, in a case of acute mastoiditis, we have diagnostic plates which allow us to temporize, would it be possible to observe the progress of the bone disease on serial plates, and, if the progress was that of increasing bone pathology, in spite of persistent benefit symptomatically, might we expect resolution of the infection, without loss of valuable time?

Such questions were evolved from curiosity aroused by cases which showed unexpected benefit following diagnostic exposure to the roentgen ray, of which a few representative histories are given here as examples.

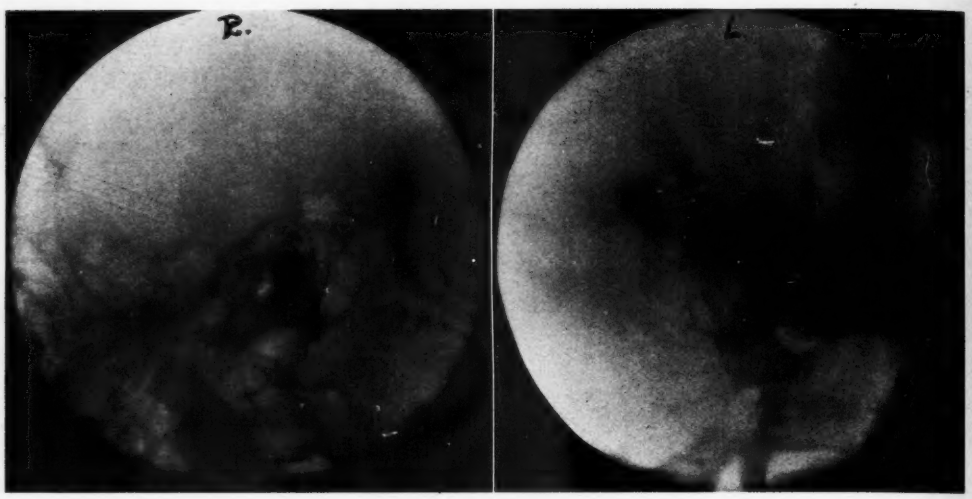

Fig. 5. Case 23, Table I.—This plate shows marked clouding of the mastoid in an infant. The clinical picture of mastoiditis was severe. The ear returned to normal five days after the second exposure.

Mrs. P. F., age 32 years. Paracentesis of the right drum was performed April 12, 1923. A week later the patient developed severe mastoid pain, headache, insomnia, and a temperature of 103°. The discharge was purulent and profuse. The drum was puffy and red, and the canal fundus was contracted. On April 19, the patient was hospitalized for operation. The urine was negative. The blood count showed 4,500,000 red blood cells, 14,800 white blood cells, and 80 per cent polymorphonuclears. X-ray examination showed a large cellular mastoid, markedly clouded, with softening of many cell walls. The temperature, pain, and headache disappeared immediately after X-ray exposure. Because myocarditis made this patient a poor risk, and on account of the favorable turn in the clinical picture, operation was deferred. Otoscopic examination the next day showed general improvement. Four days later insomnia and pain reappeared, and the temperature rose to 101°. The mastoids were again examined roentgenologically. The right one showed more softening than before, but the temperature, pain, and insomnia promptly disappeared following this second exposure, and discharge diminished considerably. The patient was sent home from the hospital on April 30, with the following otoscopic findings: scant discharge, no fundus contraction, drum pink and flat, no tenderness. Office examination on May 5 showed the right drum healed and normal in color and position and the patient felt perfectly well. Three weeks later the ear function was normal.

I. M., age 10 years, March 17, 1924. There was a history of discharge from the right ear for one month, which had been more profuse a few days preceding examination. The drum was red and puffy, and there was marked sagging of the posterior superior canal wall and marked tenderness over the entire mastoid cortex. Diagnostic plates were made, showing marked clouding of a cellular mastoid. Operation was advised, to be performed the next day, but the patient was so markedly improved over night that operation was deferred. The pain and tenderness disappeared, the canal picture improved, and the patient was discharged from observation and treatment on

Fig. 6. Case 24, Table I.—There is marked clouding of the right mastoid, with softening and probably destruction. The otoscopic picture was that of severe mastoiditis, for which several otologists indicated operation, as we also did. Recovery was prompt after the second exposure.

April 5, the drum, canal, and function having returned to normal.

B. P., age 40 years, Oct. 1, 1924. The patient complained of sharp pains in both ears, especially at night. Both ears had been discharging for nine weeks, following spontaneous perforation. Diagnostic plates of the mastoids were made, and the pain disappeared at once. Two days later the ears were dry.

SCOPE OF WORK

We have observed a large number of cases with histories such as the three described above. Many were cases of severe otitis media, while others, beyond any question, were surgical mastoiditis. For lack of control cases, this report will not concern itself with the large number of cases that received but one roentgen-ray exposure. We shall deal exclusively with those cases observed in our office practice that have been examined roentgenographically on two or more occasions, and either resolved to the state of being cured, or else came to operation.

A series of 38 cases is tabulated, each one of which presented, at one time or another, a sufficient combination of cardinal symptoms, otologic signs, and laboratory findings, along with roentgenographic evidence to indicate mastoidectomy. There is considerable difficulty involved in the preparation of a table or chart that will permit the description of all the signs and symptoms in each case. Therefore, we have tabulated the significant treatment data and made comments wherever they were deemed advisable. Certain factors common to all the cases on

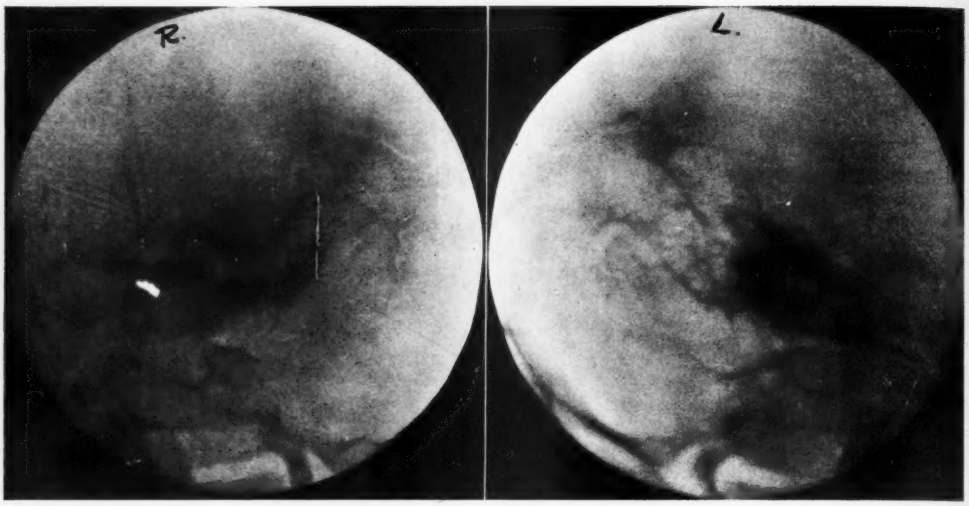

Fig. 7. Case 25, Table I.—The right mastoid, infantile cellular type, is markedly occluded. The ear became normal five days after the second exposure.

the day of the first X-ray exposure may be described here.

All cases in this series presented red, puffy drums, the amount of edema of the drum membrane varying from a marked bulge to a nipple which hung from the roof to the floor of the canal, obscuring the rest of the drum. In all but 11 cases the canal fundus was contracted. The middle ear discharge could be increased in quantity by finger pressure on the internal jugular vein in all but 13 cases. There was exquisite tenderness over the entire mastoid cortex in 20 cases. There was exquisite tenderness over the antrum and tip in 11 cases, and marked tenderness over the antrum in seven. There was marked periosteal thickening in one case. There were pain and headache in 28 cases, and insomnia in all but seven. In the 38 cases, the sexes were equally represented. The nutrition was good in 17 cases, fair in 20, and poor in one. The ear infection resulted from the following diseases:

Rhinitis	23 cases
Grippe	5 cases
Tonsillitis	3 cases
Scarlet fever	2 cases
Measles	2 cases
Pansinusitis	1 case

Swimming was the etiologic factor in one case; and, in the last case, irrigation of the nose for ozena set up the ear infection. The right mastoid was involved in 17 cases; the left, in 19 cases, and both mastoids in two cases. In only three cases had there been previous ear disease.

COMMENTS

Case 7.—The patient entered the hospital for operation, but X-ray examination there relieved symptoms. The ear cleared up and function returned to normal.

Case 10.—The patient developed a nipple drum, pain, and insomnia, accompanied by a profuse discharge, two weeks after the first exposure. The second exposure cleared all symptoms and within 48 hours the ear was dry.

Case 17.—The patient slept well after the first exposure, but retained sagging and tenderness until after the second exposure. X-ray film made 20 months later showed sclerosis in the coalesced area (Figs. 2, 3, and 4).

TABLE I.—CASES OF ACUTE MASTOIDITIS CURED WITHOUT OPERATION, FOLLOWING TWO OR MORE EXPOSURES TO THE ROENTGEN RAY

Case	Name	Age	Paracentesis or spontaneous perforation	Duration of earache before paracentesis or perforation, days	Temperature range before first X-ray exposure	Duration of discharge before first X-ray exposure, days	Interval between first and second X-ray exposures, days	Interval between second and third exposures, days	Duration of discharge after first X-ray exposure, days
1	P. F.	32	P	3	100-103	10	5		21
2	P. A.	35	P	4	99-101	5	4		40
3	I. M.	10	S	3	100-102	30	3		18
4	S. W.	11	S	3	101-102	18	10		23
5	G. R.	21	P	2	100-101	9	5		14
6	R. J.	11	P	4	101-102	21	7		30
7	M. G.	42	S	1	101-102	4	15	6	34
8	G. E.	4	P	3	100-101	18	11		21
9	W. S.	12	P	3	101-102	3	4		13
10	B. S.	4	P	3	101-103	4	15		17
11	W. T.	3	P	5	100-101	26	3		8
12	B. Z.	6	P	4	100-101	17	3		7
13	M. G.	26	P	1	100-101	8	7		13
14	A. M.	33	P	3	100-101	13	3		1
15	B. L.	49	S	7	101-102	16	2		11
16	C. S.	5	S	1	101-102	8	3		9
17	R. F.	14	P	2	102-103	24	1 T	1 T* F	10
18	H. S.	3	S	7	101-102	14	2		14
19	E. R.	3	S	3	100-101	21	7		10
20	S. K.	46	P	3	100-104	2 p	3		7
21	A. G.	70	P	6	100-101	16	2 T	3 T*	12
22	L. W.	18	S	4	101-102	4	3		10
23	C. N.	2	S	3	99-100	14	4		9
24	G. W.	6	S	3	100-102	9	4		14
25	M. S.	2	P	3	100-102	10	2		7
26	R. G.	55	S	7	100	21 T*	3		1
27	S. B.	3	S	2	101-106	20 T*	3 T*		14
28	M. G.	2	P	2	101-104	18	4 T*	7	20
29	S. H.	5	P	6	100-101	10	3	3	11
30	R. R.	5	P	3	100-104	6 p	4 T*	7	14
31	A. S.	30	P	2	100-101	5	3 T*	3	8
32	M. K.	2	P b	2	102-103	5	4	6	19
33	T. K.	6	P	5	101-103	5	3	10	17
34	M. S.	3	P	2	101-102	7 p	4 T*p	5 T*p F	14
35	B. B.	29	P	5	101-102	47	1	1 F	32
36	I. K.	7	P	2	100-103	10	3	4 T*	15
37	E. L.	8	P b	4	101-102	10	3	4 T*	13 :20
38	I. S.	26	P	4	100-101	30	2		4

Each X-ray exposure means two plates each side
T—Therapy dose
T*—Therapy dose plus two plates each side
P—Paracentesis
S—Spontaneous perforation
F—Fourth exposure
b—Bilateral
p—Portable X-ray apparatus used

Case 20.—The portable X-ray apparatus was used at the patient's home on account of his temperature (104°), severe pain, and insomnia, which were unrelieved by opiates. Remarkable relief followed the X-ray exposure.

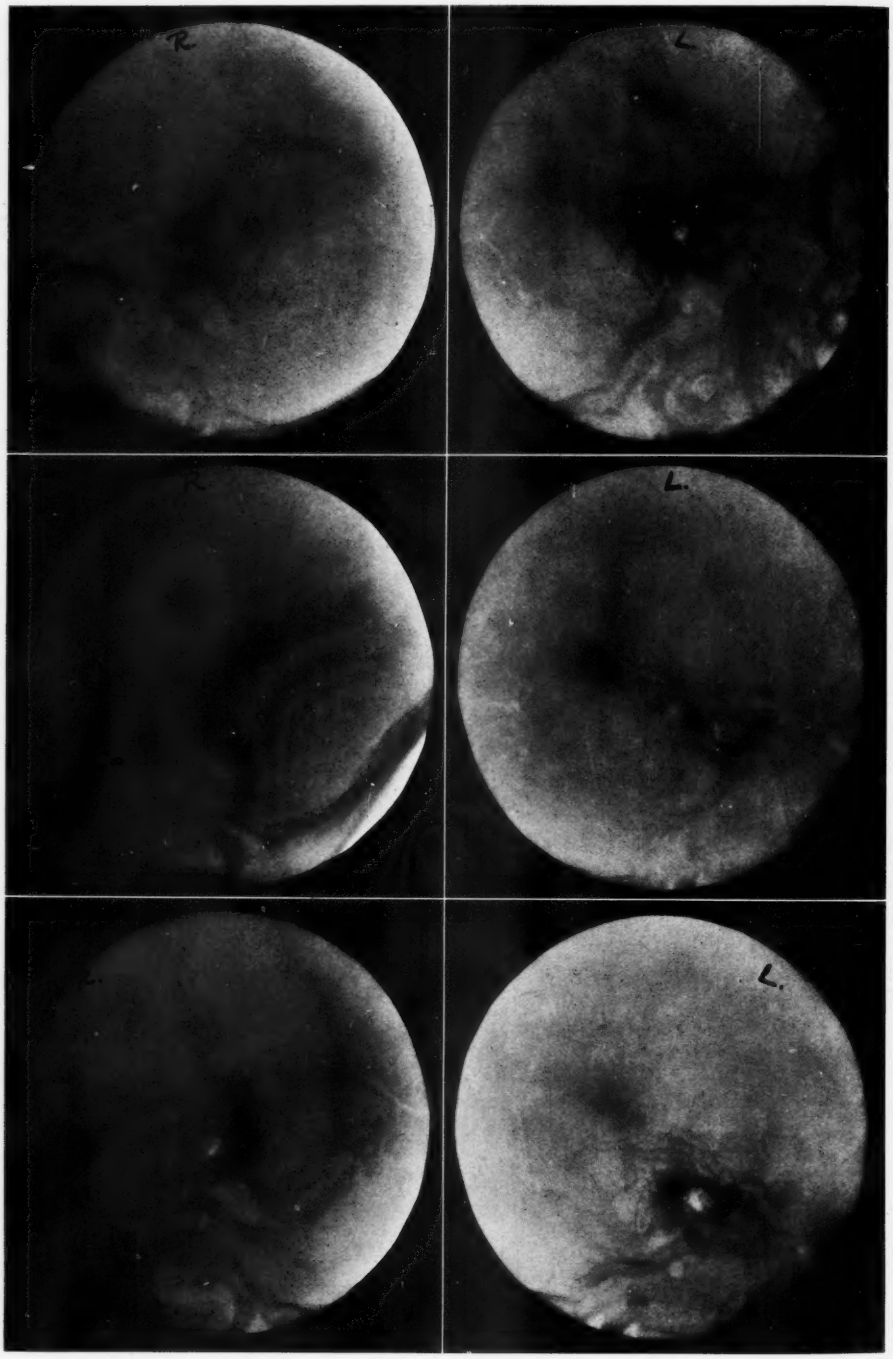

Fig. 8 *(above)*. Case 32, Table I.—This is a case of bilateral mastoiditis, with profuse purulent discharge from both ears. Both drums were red and nippled, and there was sagging in both canals. Pain

(Continued on next page)

and insomnia, and exquisite tenderness over both mastoids were among the symptoms. The morning temperature on the day of exposure was 103°, while that on the day following was 100°. The right mastoid is occluded throughout; fuzziness of the cell walls denotes softening. The left mastoid is smaller, of the infantile type; the peri-antral region is clouded and the cells are occluded. Aeration was present only in one large posterior cell. The emissary vein is visible on both sides, being more clearly so on the right.

Fig. 9 *(center)*. Case 32, Table I.—Eleven days after Figure 8 was made. Just prior to this exposure, the right ear showed a profuse discharge, an increase in discharge on jugular pressure, a nippled edematous drum, and a marked sagging of the posterior and superior canal walls. The temperature was 101°. Periosteal thickening was present. The left ear was nearly dry and the drum almost normal in appearance. The temperature dropped to 99.8° after this exposure. This plate shows, in the right mastoid, increased bone pathology, destruction being evidenced by several areas of coalescence. The emissary vein is more prominent than before. The left mastoid shows increased aeration and less clouding in the peri-antral region, with beginning definition of the peri-antral cells.

Fig. 10 *(below)*. Case 32, Table I.—Nineteen days after Figure 9. The ears were dry and the drums had returned to normal. The temperature was normal and the patient slept, played, and ate well. The plate shows better aeration in both mastoids, which is more evident in left. Cell definition is becoming clear in the right mastoid. Evidently, the otologic signs of recovery precede the X-ray signs by a considerable period of time.

Case 30.—A streptococcus hemolyticus infection was present. The white blood count was 15,000. The same disease occurred in the other ear three weeks later, resolution and cure taking place after three X-ray exposures.

ANALYSIS OF TABLE I

In all cases, each X-ray exposure was followed by relief of the pain, tenderness, and insomnia within 24 hours. In all cases the temperature dropped to normal or close to normal within 24 hours. In all cases the discharge was lessened, and was changed from purulent to mucopurulent. Four cases showed sagging after the first exposure; five showed sagging after the second exposure, but in all these cases it cleared up subsequently. Ten cases received a therapy dose, the average time for cessation of discharge following the therapy dose being six days. There were no complications of any kind subsequent to any of the X-ray exposures.

Interval between first and second exposures—average number of days, 3-4.

Interval between second and third exposures—average number of days, 5.

Interval between third and fourth exposures—average number of days, 3.

Subsequent to the first exposure, 25 ears were dry within two weeks, 15 were dry in from two to six weeks.

Subsequent to the second exposure, 31 ears became dry within two weeks; nine required two weeks or more to become dry.

CONTROL CASES

A series of seven cases is now presented in Table II, all of which came to operation after two or more roentgen-ray exposures. Incidentally, they were all females.

DISCUSSION

The cases which were operated upon deserve discussion individually for their speeal features.

Case 1. The child had been ill with whooping cough for five weeks. Earache and temperature of 105° for three days indicated paracentesis. A mild pneumonia followed for about eight days. Diagnostic X-ray films, made 20 days after paracentesis had been performed, showed moderate clouding of the right mastoid. This exposure was followed by less discharge and restful sleep. A week later, there was pain, accompanied by temperature of 100.2°. The periosteum was thickened; the drum red and swollen. A second X-ray exposure showed softening and destruction. The posterior superior canal wall was sagging; the discharge was increased on jugular pressure. Upon operation, the findings were: bone softened, no free pus, several coalesced

TABLE II.—CASES OF ACUTE MASTOIDITIS WHICH CAME TO OPERATION, FOLLOWING TWO OR MORE ROENTGEN-RAY EXPOSURES

Case	Age	Paracentesis or spontaneous perforation	Duration of earache before paracentesis or perforation, days	Temperature range before first X-ray exposure	Duration of discharge before first X-ray exposure, days	Interval between first and second X-ray exposures, days	Interval between second and third X-ray exposures, days	Interval between first X-ray exposure and operation, days
1	3	P	3	100-105	20	7	3	11
2	12	S	1	99-100	18	6		10
3	20	S	2	101-103	4	4		8
4	49	S	1	99-100	30	7		8
5	24	P	3	100-103	5	5	3	13
6	4	P b	3	100-105	5	4	20 L	4
7	24	P	4	100-104	4	1		2

P—Paracentesis
S—Spontaneous perforation
L—Left side
b—Bilateral

areas filled with polypoid granulation tissue. Microscopic examination of this tissue showed fibroblastic granulations throughout. One cannot say whether or not this child would have recovered with more roentgen-ray exposures. Recovery after mastoidectomy was rapid and uneventful.

Case 2. The child reacted very well to both exposures; but, on the day of the second exposure, developed the Griesinger sign, which indicated interference with the sinus circulation. Operation was performed, and a large perisinus abscess was found, the sinus lying close up to the antrum. The white count before operation was 22,000, with 94 per cent polymorphonuclears (Fig. 12).

Case 3. This young woman was septic, and remained septic, due to a streptococcus hemolytic infection. Insomnia and pain were influenced by the X-ray exposure for only about ten hours. Her temperature varied several times a day, ranging from 101° to 103°. The tenderness was always exquisite along the posterior border of the mastoid, and, when operation was performed, we found pure pus confined solely to several large posterior cells. Recovery was very prompt.

Case 4. The woman had had a discharging ear for one month. The drum healed and she felt well, but came to us for a check-up. The drum was normal in appearance, but the canal fundus was markedly narrowed. X-ray examination showed several areas of destruction. The patient slept well and had no temperature. Six days later she experienced pain behind the ear, and an evening rise in temperature. Roentgenographic examination again showed the same areas of destruction. Operation was advised and performed, disclosing a large perisinus abscess with granulations on the sinus about 2 cm. in length. Recovery was rapid.

Case 5. One week postpartum, this patient required paracentesis of her left drum. She had a very severe tonsillitis and pansinusitis. Pain and insomnia continued after

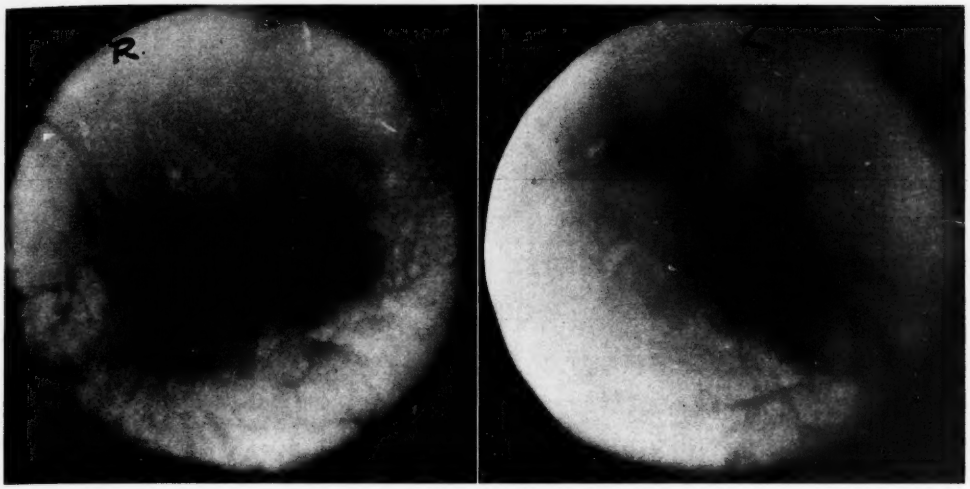

Fig. 11. Case 34, Table I.—Scarlet fever: the plates were taken at home with portable apparatus. Note that the left mastoid cells are completely occluded and the sinus plate prominent, with softening throughout; also there is dilatation and prominence of the emissary vein.

paracentesis. X-ray examination showed clouding of the left mastoid. She reacted well to this exposure, but the nose was discharging profusely in spite of regular maxillary antrum irrigations. Subsequent X-ray examinations of the mastoid showed destruction. The patient slept well and felt well, but ran a low-grade temperature, therefore, operation was performed to relieve the low-grade sepsis. Free pus was found in several large coalesced areas. Recovery was uneventful.

Case 6. This patient became very septic after a follicular tonsillitis, running a saw-tooth temperature between 100 and 105°. X-ray examination showed occlusion of both mastoids five days after incision of the drums. She did not react favorably to the first exposure, and a second exposure four days later showed destruction in the right mastoid. Operation was performed on the right mastoid. The temperature dropped from 104° to normal and stayed normal thereafter. The left ear continued to discharge, but became dry 11 days after a third exposure, or 40 days after incision. This was a case of acute fulminating mastoiditis which did not show any effect from X-ray exposure and was relieved only by surgery. Both ears showed about the same severity of infection, and we feel that the recovery of the left ear was due to early intervention on the right side as well as the final touch of the third X-ray exposure.

Case 7. A young woman, who was poorly nourished, was very septic following a severe tonsillitis. Saw-tooth temperature, pain, and insomnia were unrelieved by X-ray exposure. The patient exhibited a drawn, anxious facies. No one could deny surgical help in this case of true fulminating, septic mastoiditis. The streptococcus hemolyticus was recovered from the mastoid wound.

These seven cases constitute the total number upon which we have operated subsequent to two or more X-ray exposures.

DOSAGE

As early as 1924 we had noted favorable changes in the clinical course of acute mastoiditis following roentgenographic exami-

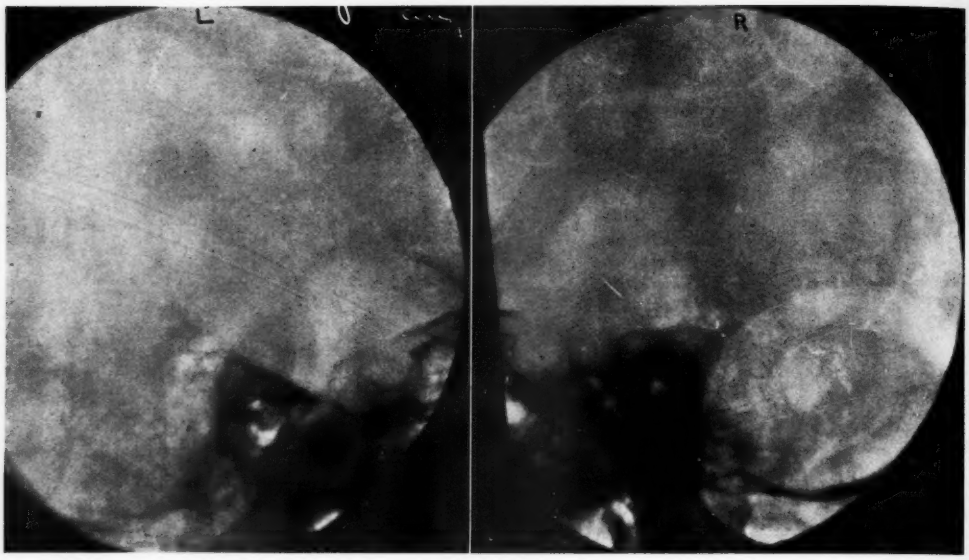

Fig. 12. Case 2, Table II.—Note the prominent lateral sinus in the right mastoid plate. The anterior sinus wall lies close to the antral region. Operation, which was indicated on account of the Griesinger sign, disclosed a large perisinus abscess.

nation. Prior to this date, only one plate of each mastoid was taken at each roentgen-ray examination; but, from this date on, two plates of each side were made at each roentgenographic examination. It is only since this change in routine that the favorable results herein reported were observed. For this reason we believe that the amount of irradiation incidental to making one plate of each mastoid is below the dosage required to produce the favorable effect.

The amount of irradiation used on the above cases may be judged from the following statement of technic employed on a standardized X-ray machine.

For diagnostic plates: Ma., 30; time, one-third second to two seconds for each plate, depending on the age of the patient; focal distance, 25 inches; gap, 4 inches; Law position; cone, 3 inches; two plates each side.

The therapy dose mentioned, and marked "T" in Table I, is 25 per cent of an erythema dose, given as follows: Ma., 7.5; time, 50 to 90 seconds; focal distance, 16 inches; gap, 6.5 inches; Law position; cone, 3 inches; one fiber filter. The pathologic ear is placed nearer the tube, as it then receives the greater amount of irradiation.

We have used this "T" dose in a few cases to determine whether or not it offers a more rapid resolution of the pathologic process: it was also used in cases that exhibited more severe clinical symptoms.

SUMMARY

1. In over 85 per cent of our cases, the roentgen ray caused an apparent change, within 24 hours after exposure, in the clinical picture of acute mastoiditis, affecting the temperature, pain, insomnia, and the amount and character of the discharge. This syndrome of favorable action is characterized by:

(a) Lowered temperature
(b) Cessation of pain
(c) Absence of insomnia

(*d*) Lessened quantity of discharge

(*e*) Change in the character of the discharge from purulent to mucopurulent

2. When, and if, the original symptoms recur, another exposure to the roentgen ray is given, then, in the great majority of cases, the syndrome of favorable action recurs; after this manifestation, resolution of the mastoid infection may be expected.

3. Third and fourth exposures to the roentgen ray may be necessary in the more stubborn cases to secure resolution of the infection, especially in cases which show increasing bone pathology on X-ray examination, providing each exposure is followed by the syndrome of favorable action.

4. A dosage ranging from between that required for making two plates of each mastoid to a 25 per cent erythema dose seems to be optimum for the apparent therapeutic effect. Such dosage is considered one exposure.

5. From experiences described herein and otherwise, we deem it inadvisable to attempt roentgen-ray therapy for acute mastoiditis under the following circumstances:

(*a*) when there is edema over the mastoid, or perforation of the cortex;

(*b*) when there is extensive destruction of the mastoid process as shown on the roentgenogram;

(*c*) when, in acute fulminating mastoiditis, roentgen-ray exposure fails to induce the syndrome of favorable action;

(*d*) when the patient is diabetic, and there is evidence of bone destruction, even though the clinical picture is mild;

(*e*) when the Griesinger sign is present, indicative of perisinus abscess or sinus thrombosis;

(*f*) when the roentgenogram shows a cellular mastoid with the sigmoid sinus extending more anteriorly than usual, so that it impinges upon the antral region, plus a marked clouding or softening. The strong possibility of perisinus abscess formation should lead one to operate.

(*g*) when there is lowered resistance and low-grade sepsis, and serial plates show progressive destruction; and when further toxemia might seriously impair the recuperative power of the patient;

(*h*) where there are symptoms of sinus thrombosis or phlebitis, meningitis, labyrinthitis, or brain abscess.

CONCLUSIONS

1. If exposed on two or more occasions, acute mastoiditis, without bone destruction, frequently resolves under the influence of the roentgen ray.

2. If exposed on two or more occasions, acute mastoiditis, with bone softening and destruction, may resolve under the influence of the roentgen ray.

3. The roentgen ray exerts an influence upon acute mastoiditis which we have termed a syndrome of favorable action. In most cases, this influence is followed by resolution of the infection, and it is, therefore, considered a therapeutic agent. In some cases, even though this influence is experienced, operative interference is indicated.

RECOMMENDATIONS

1. It may be advisable, as a prophylactic measure against mastoid disease, to treat acute otitis media by X-radiation at the end of the first week of discharge, and at three-day intervals thereafter, for three exposures, all told. This formula is chosen arbitrarily from our experience at the present time.

2. Once again, a plea is made for closer co-operation between the roentgenologist

and the otologist, because such co-operation must be conducive to a better understanding of the treatment of acute mastoiditis, a diminution in the percentage of cases coming to operation, and the development of an optimum dosage formula for the roentgenographic treatment of mastoiditis.

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Blocks of Millions of Atoms Make Up Solid Matter.—The matter that seems to ordinary eyes so solid and unbroken is actually made of blocks, somewhat like a tile floor, each block made of several million atoms, Dr. Francis Bitter, of the Westinghouse Research Laboratories, has just established for the first time through magnetic researches.

Reporting to the American Physical Society, Dr. Bitter described his experiments that upheld the previous theory that contends such block structure in solids exists.

A magnetic powder was suspended in a liquid which was allowed to evaporate on a shiny surface of the metal cobalt. As the liquid evaporated a regular lace-work appearance was produced by the grouping of the particles. As these deposits were arranged in the form of hexagons, the Doctor concluded that the blocks of the metal itself had just this hexagonal arrangement. Magnetization of the cobalt specimen changed the pattern to a series of not quite parallel lines, showing that the blocks had become differently arranged under the influence of the magnetic force. Irregularities in the pattern were produced, he believes, by impurities in the metal.

This brick or mosaic structure provides the key to some of the most baffling problems about the strength and electrical resistance of solids.

Dr. Bitter's discovery was not accidental but followed logically from a long series of theoretical investigations in which he studied what would be the consequences of such a block structure in solids.

It is of interest, furthermore, that Dr. Bitter is the son of Karl Bitter, internationally famous sculptor.—*Science Service.*

RADIOTHERAPY OF PITUITARY TUMORS

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THE use of the roentgen ray as a therapeutic procedure in the treatment of pituitary tumors was first instituted by Gramegna and Béclère over twenty years ago. The more recent reports in the literature by Sgalitzer (1), Béclère (2, 3), Heinismann (4) and others are indicative of the widespread and accepted use of this form of therapy.

It is not our purpose to go into the historical difficulties in the treatment of pituitary tumors. It is sufficient to state that glandular and surgical methods have not always been rewarded by gratifying results. Hence, an addition to the therapeutic armamentarium which proves its value is an important contribution.

The early successful efforts obtained with roentgen rays in treating hypophyseal tumors have been amplified by the favorable results noted in this country and abroad, *e.g.*, Bailey (5), Borak, Grant (8), Sgalitzer (1). The experience thus gained enabled the observers to a certain extent also to predicate the type of tumor with which they were dealing by the type of response to the roentgen ray (radiosensitivity). Thus, cystic tumors of the pituitary are known to be highly radioresistant to deep X-ray therapy, while the eosinophilic adenomas respond with fair promptness (Sgalitzer, 1). This observation explains to some degree the great variability in the results obtained.

Our present study is limited to thirteen cases in which the clinical picture of tumor in the pituitary region was manifested by visual disturbances, headache, dyspituitarism, and radiographic changes in the sella turcica.

The salient features of the thirteen cases are best illustrated by the accompanying tabulation.

COMMENT ON TABLE

(A) Predominating Symptoms

1. Headache in five cases.
2. Visual disturbances in eleven cases (limitation of fields or diminution in visual acuity).
3. Polydipsia and polyuria in five cases.
4. Acromegaly or adiposo-genital dystrophy in eleven cases.
5. Menstrual disorders in seven of ten women.
6. Somnolence in three cases.

(B) Sex and Fertility

Of the thirteen cases reported above, ten were females. As might be expected, menstrual irregularity or cessation of menses was a frequent symptom, occurring in seven patients. Of the nine married patients in this series, eight had children before the onset of symptoms while the ninth practised contraception. The male patients suffered from impairment of libido and potency.

(C) Sella Turcica Changes

All cases except No. 3 and No. 11 showed definite erosion of the sella turcica.

(D) Type of Dyspituitarism

Although evidence of a mixed type occurred in some cases, the classification was based upon the preponderant symptomatology. Cases Nos. 1, 2, 4, 6, 9, 12, and 13 were classified as hypopituitarism, while Cases Nos. 3, 5, 7, 8, and 11 belonged to the group of hyperpituitarism. Case No. 10 did not show dyspituitarism but, in view of

TABLE ILLUSTRATING THE SALIENT FEATURES OF THIRTEEN CASES OF TUMOR IN THE PITUITARY REGION TREATED BY RADIOTHERAPY

Designation of subject			Symptoms	Findings	Treatment		Results	Date of last examination	Notes
No.	Age	Sex			Operation	Radiotherapy			
1737 I Adm. Dec., 1925	29	♀	Headache, failing vision, polydipsia, polyuria, transitory hemiplegia, amenorrhea, somnolence Onset, 8 years	Hypopituitarism, obesity, optic atrophy, bitemporal hemianopsia Visual acuity— 10/200 O.D. 20/ 50 O.D. Sella turcica, enlarged	Subsellar decompression, with intranasal radium application	4 courses	Vision improved, extremities smaller, less somnolence, polydipsia and polyuria diminished, mentally more alert. Visual acuity 10/15 O.U. Hemianopsia reduced to quadrantic defect	March, 1931	Patient able to do housework
1504 II Adm. Oct., 1925	31	♀	Progressive loss of vision, amenorrhea, gain in weight, polyuria Onset, 3 years	Primary optic atrophy, increased sugar tolerance, diminished deep reflexes X-ray of skull, negative	None	4 courses	Initial improvement only, vision better, menses returned twice (Dec., 1925, June, 1926) Recently impairment of vision recurred Otherwise unchanged	April, 1931	Patient refused operation Diagnosis, craniopharyngeal pouch cyst One child
3827 III Adm. Mar., 1929	26	♀	Acromegaly, hypertrichosis, menstrual irregularity Onset, 1½ years	Acromegalic features, normal visual fields, sella turcica enlarged, somnolence	None	1 course	More alert, extremities smaller, acromegaly less pronounced, menses regular but scanty, memory better	December, 1931	Now attends Teachers' Training School
3876 IV Adm. Apr., 1929	45	♀	Visual impairment Onset, 2 years	Bilateral optic atrophy, bitemporal hemianopsia, "pituitary facies," sella turcica changes	None	3 courses	Distinct improvement — (vision better) after each course, has returned to housework	February, 1931	Visual fields: slight restriction of left inf. temporal field only now; right temp. hemianopsia as before; reads better Menopause at 42 Five children

3954 V Adm. May, 1929	42	♀	Enlargement of extremities, change in voice and appearance, impairment of vision, amenorrhea Onset, 7 years	Acromegalic features, sella turcica changes, visual fields normal, macroglossia, basal metabolism +15	None	3 courses	Mild improvement, vision better, facies less acromegalic, basal metabolism still elevated	January, 1931	Reading easier and more distinct, distant objects clearer Three times pregnant
4400 VI Adm. Feb., 1930	18	♀	Blurring of vision, menstrual irregularity Onset, 3 months	Papilledema O.D. 4 D O.S. 3 D Obesity, increased sugar tolerance, sella turcica enlarged Visual acuity 10/15	None	2 courses	Improved Papilledema receding O.D.—2 D. O.S. —1½ D. Visual acuity 20/20 Menses still irregular	March, 1931	Patient working
4750 VII Adm. July, 1930	30	♂	Visual impairment, polydipsia, polyuria, impotence Onset, 1 year	Pallor, dry, coarse skin, scant hirsutes, slight acromegaly, limitation of visual fields, sella turcica changes	None	1 course	Marked improvement *i.e.*, vision better, disappearance of central scotoma for color, less polydipsia and polyuria, more alert, basal metabolism rose from —29 to —9	January, 1931	Two children
3848 VIII Adm. Mar., 1927	51	♀	Enlargement of extremities, visual impairment, amenorrhea Onset (1923), 6 years	Acromegalic features, optic atrophy, sella turcica changes, incomplete amaurosis, left VII n. palsy	None	3 courses	Initial improvement only, somnolence gone, mentally more alert, less irritable, vision unchanged	March, 1931	Seven pregnancies
2990 IX Adm. Oct., 1927	21	♀	Headache, polydipsia, polyuria, amenorrhea Onset, 5 years	Dystrophia adiposogenitalis, left homonymous hemianopsia, sella turcica changes, paresis of ext. recti	Transfrontal, craniotomy with partial removal of craniopharyngeal pouch cyst	2 courses prior to operation	Not influenced by X-ray therapy	Prior to death March, 1928	Patient developed rt. hemiplegia with aphasia 4 months after operation, with exitus (no autopsy allowed)
4762 X Adm. Sept., 1930	50	♀	Diplopia, headache, vomiting, fatiguability Onset, 1½ years	Bilateral ophthalmoplegia, sella turcica changes	Exploratory craniotomy Dec., 1930	1 course prior to operation	Initial improvement; diplopia, headache, and vomiting disappeared, ophthalmoplegia less marked; then recurrence, operation, exitus		Postmortem showed craniopharyngeal pouch cyst
4059 XI Adm. July, 1929	49	♀	Headache, enlargement of extremities, photophobia, polydipsia, polyuria Onset, 9 years	Acromegalic appearance, hypertrichosis, fundi negative, tongue large, neg. X-ray findings	None	2 courses	No change	November, 1930	Seven pregnancies, menses irregular of late

TABLE ILLUSTRATING THE SALIENT FEATURES OF THIRTEEN CASES OF TUMOR IN THE PITUITARY REGION TREATED BY RADIOTHERAPY—*Continued*

Designation of subject			Symptoms	Findings	Treatment		Results	Date of last examination	Notes
No.	Age	Sex			Operation	Radiotherapy			
2709 XII Adm. May, 1927	56	♂	Headache, visual impairment, impairment of memory Onset, 3 years	Froelich habitus, central scotoma, contraction of color fields, pallor of right optic nerve, marked sella turcica changes	None	3 courses	Marked improvement (*a*) Disappearance of headache (*b*) Vision for distance and reading practically normal (*c*) Potency preserved (*d*) Memory good Persistence of hitemporal limitation for color	April, 1931	Patient is conducting business, 7 children
1690 XIII Adm. Jan., 1926	20	♂	"Failure to grow" over period of 7 years	Genital infantilism, dwarfism, anisocoria, temporal optic n. pallor, marked sella turcica changes	None	2 courses	No change	October, 1926	Patient observed for only 10 months

the ophthalmologic signs and sella turcica changes, it was suspected clinically of being a possible tumor of the pituitary region.

TECHNIC

The technic consisted of a series of nine X-ray treatments given at two- or three-day intervals, each treatment 20 to 40 per cent S.E.D. (skin erythema dose), 860 r units[1] equal to 1 skin erythema dose. Three portals of entry were usually employed, *viz.*, one frontal and two temporal fields. Each field received 1 skin erythema dose. The filter was 0.5 mm. Cu and 1 mm. Al. The voltage was 180 to 200 kilovolts. Between the series of treatments, an interval of from three to six months elapsed.

In one case (No. 1) the X-ray treatment was preceded by a subsellar decompression and an intranasal surface application of radium.

RESULTS OF THERAPY

Symptoms

Headache.—There was relief in three of five cases in which headache was a prominent symptom. In one instance (No. 10) the recurrence of symptoms did not include headache.

Visual Disturbances.—Of eleven patients complaining of impairment of vision, eight were benefited. The improvement occurred even in some of those cases in which optic atrophy, with bitemporal hemianopsia, existed. The improvement was evidenced by less marked limitation of visual fields and greater visual acuity. In some cases, the patients manifested a greater control of the oculo-motor mechanism. It may be stated that the greatest improvement occurred in those cases in which treatment was begun in the early stages of the disease.

[1]This dose of 860 r units (including back-scattering from the patient) represents an erythema dose. The r unit refers to the International Roentgen Unit as recently adopted by the Bureau of Standards, Washington, D. C.

Polydipsia and Polyuria.—Three of the six patients with a diabetes insipidus syndrome showed a definite diminution in symptoms.

Dyspituitarism.—Berven (6) and others have expressed doubt that regression in skeletal overgrowth may occur. In Cases No. 1 and No. 3 regression was definitely shown by the fact that, after radiotherapy, these patients wore smaller shoes and gloves. Another patient (Case No. 5) was told by her family and friends after the third course of treatment that her features did not look "so big."

Menstrual Disorder.—Following treatment, there was a return of menses in three cases. In Case No. 3 the return of menses persists regularly, although scantily. In Case No. 2, there was a menstrual flow on two occasions, each time following a course of treatment. In Case No. 6, for a time the regularity of menstrual flow approximated a return to normal but later again became irregular. In other cases of amenorrhea, the patients were either in the normal menopause years or the cessation of menses had existed for a long time.

Somnolence.—In four cases there was a definitely more alert attitude noted following treatment.

VALUE OF SUCCESSIVE SERIES

It has been stated that no improvement is noted after the third series of treatments (Berven, 6). While it is true that the greatest improvement may be expected after the first or second course of deep X-ray therapy, we have been able to observe definite improvement after the third course of treatment (Cases Nos. 1, 4, and 5).

DURATION OF OBSERVATION

These cases were followed over varying periods of time, from nine months (Case No. 10) to six years (Cases Nos. 1 and 2). Case No. 13 moved away and could not be traced.

COMMENT

Variation in technic has been stated by Béclère (2) to be the chief reason for the unsuccessful results obtained in the treatment of pituitary tumors with the roentgen ray. This may be applicable to a limited extent only, for, in our experience, variation in technic has failed in some cases to alter the unfavorable course and progressive advance of the disease (Cases Nos. 9, 11, and 13). The variation in the response to treatment, we believe, is due, rather, to the type of neoplastic tissue, *i.e.*, radiosensitivity of the tumor. Cyst formation, macroscopically evident, is the most likely reason for failure of radiotherapy in certain cases. This point is strikingly exemplified in Case No. 10, in which autopsy showed a craniopharyngeal pouch cystic tumor, and in Case No. 9, in which a similar tumor was partially removed at operation. Of interest is the fact that Case No. 10 showed definite, though temporary, improvement after deep X-ray therapy.

The cardinal value of deep X-ray therapy as compared to surgical intervention lies in the beneficial results obtained in the majority of cases, with the absence of immediate mortality. This is in accordance with a critical analysis of the literature. It is not assumed that radiotherapy can entirely replace surgical interference. It is recognized that under certain conditions urgent surgical intervention is indicated, *i.e.*, marked intracranial pressure with increasing loss of vision. In view of the foregoing, it may be stated that the patient presenting signs and symptoms of pituitary tumor should first have the benefit of a therapeutic trial with radiotherapy. Surgery may be resorted to in those cases in which this form of therapy has failed to influence the course of the disease. It may be added that radiotherapy subsequent to the operation has been found

to be a valuable therapeutic adjuvant and has been adopted as a routine procedure.

CONCLUSIONS

1. Thirteen cases of pituitary tumor were subjected to roentgen-ray therapy and observed at trimonthly intervals for varying lengths of time.

2. Ten of the thirteen cases were females, three were males.

3. Endocrine dysfunction consisted of manifestations of hypopituitarism in eight cases and of hyperpituitarism in four cases.

4. Seven of the thirteen cases were distinctly benefited by the treatment and one showed temporary improvement. Amelioration of headache and improvement in vision were most frequently noted. In no case was there a complete disappearance of symptoms.

5. Failure to respond to treatment is highly suggestive of a cystic tumor (craniopharyngeal pouch cyst).

6. Patients in whom diagnosis of pituitary tumor has been made should receive therapeutic trial with roentgen therapy before proceeding to surgical intervention.

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New Process of Photography by Ultra-violet Light.—Photographic plates sensitive to ultra-violet light will shortly be made commercially by a new process, Dr. C. E. K. Mees has reported to the Optical Society of America.

"Schumann" plates used for this purpose till now were difficult to make and had to be prepared by hand. They had a coating either entirely free from gelatine or containing only a small trace of gelatine to bind the silver bromide together.

In order to avoid the use of Schumann plates, two Frenchmen, Duclaux and Jeantet, suggested the treatment of ordinary plates with a fluorescent substance which glows when exposed to ultra-violet light, and they employed petroleum oils to paint it on the plates. Satisfactory results have been obtained by many workers with petroleum, but it is difficult to apply the oil uniformly and to remove it before development.

R. E. Burroughs tested a large number of organic substances and found the most suitable to be ethyl dihydrocollidine dicarboxylate, which fluoresces strongly in the ultra-violet. This substance can be applied in organic solvents, from which it crystallizes in microscopic crystals over the surface of the plate, these crystals being easily removed before or during development of the plate.—*Science Service.*

AN X-RAY STUDY OF THE PASSAGE OF DIFFERENT FOODSTUFFS THROUGH THE SMALL INTESTINE OF MAN[1]

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THE study of the passage of various foodstuffs through the stomach and intestines had been undertaken by many investigators previous to the discovery of the roentgen ray. It was impossible at that time to visualize the viscera of experimental animals except by operation, and this was undesirable as the process of digestion was thereby interfered with. These investigators could make observations only on animals having artificial fistulas, with variable results. Cannon (1), a few years after the discovery of the roentgen ray, was the first to report observations of the passage of various foodstuffs through the gastro-intestinal tracts of healthy animals.

In recent years, marked advancement has occurred in the study of the gastro-intestinal tract, due to improved roentgen-ray technic and the use of modern powerful apparatus. For this reason, we undertook the study of the passage of carbohydrate, protein, and fatty foodstuffs through the gastro-intestinal tracts of rats and human beings, in order that the findings of the earlier investigators might be compared with the results obtained through the employment of present modern facilities.

In a recent publication (2), we reported certain X-ray observations made on the passage of carbohydrate, protein, and fat through the gastro-intestinal tracts of rats. Rats were the animals of choice for our experiments because the character of their diet is closely related to that of the human species. The rat is an animal that ideally serves this purpose; in fact, it serves better than herbivorous or graminivorous mammals.

The results of these experiments showed that there was very little difference in the passage time of protein and carbohydrate through the small intestines of rats, although the protein moved slightly faster. Fats were much slower than either carbohydrates or proteins. The rates of emptying time of the stomach, small intestine, and colon were in accordance with the findings of other observers. The rates of passage of the different foodstuffs through the small intestine were at variance with those recorded by earlier investigators who stated that carbohydrates passed through the small intestine fastest, fats next, and proteins the slowest of all.

Experiments conducted on human beings are always desirable when practical, because the results of animal experiments, when compared to the results in man, often show marked discrepancies. In animal experiments, however, certain liberties can be taken with the use of the X-ray which would become dangerous when applied to the human, and often very valuable and important information is obtained that proves of value for subsequent experiments conducted on man.

In our reported study of the passage of different foodstuffs through the gastro-intestinal tracts of rats, certain information was obtained which would prove of great value if similar results could be procured in man. For this reason the following experiments were undertaken on humans. The observations herein reported are the results obtained from X-ray examinations of healthy normal individuals fed carbohydrates in the form of cream of wheat, protein in the form of casein, and fat in the form of pure cream. These individuals

[1]Read before the Radiological Society of North America at the Sixteenth Annual Meeting, at Los Angeles, Dec. 1–5, 1930.

Fig. 1. Stomach of individual fed a mixture of protein and barium sulphate in the proportion of 3 parts of protein to 1 part of barium sulphate. Film made immediately after meal.[2]

Fig. 2. Stomach of individual fed a mixture of carbohydrates and barium sulphate in the proportion of 3 parts of carbohydrates to 1 part of barium sulphate. Film made immediately after meal.

Fig. 3. Stomach of individual fed on fats, a mixture of cream and barium sulphate in the proportion of 3 parts of cream to 1 part of barium sulphate. Film made immediately after meal.

were about of the same weight, height, and age, and were fed the same amount of foodstuffs.

After being deprived of their evening and morning meals, at 9 A. M. we fed each group 170 gm. of foodstuffs in the proportion of three parts of food to one part of barium sulphate. Immediately after feeding they were carefully fluoroscoped to ascertain if any of the food had emerged from the stomach; in every instance this had occurred. This observation is in accord with that of McClure, Reynolds, and Schwartz (3). We continued our fluoroscopic observations at frequent intervals until the food column had entered the cecum.

The protein group consisted of six individuals of an average age of 30 years, average height of five feet, eight inches, and average weight of 154 pounds. They were fed a mixture of casein and barium sulphate in the proportion of three parts of casein to one of barium sulphate. They ate 170 grams.

In the carbohydrate group we had five individuals of an average age of 30 years, average height of five feet, eight inches, and an average weight of 162 pounds. This group was fed a mixture of cream of wheat and barium sulphate in the same proportion as in the protein group. They ate 176 grams.

Six individuals comprised the fat group. Their average age was 30 years, the average height five feet, ten inches, and the average weight 164 pounds. This group was given a mixture of pure cream and barium sulphate in the same proportion as in the other two groups.

Table I represents the results of observations upon the emptying time of the stomach and the cecum appearance of individuals fed different foodstuffs. As we were principally interested in the rates of passage through the small intestines of the different foodstuffs we did not continue our observation for the emptying time of the small intes-

[2]The observations of our experiments were obtained by fluoroscopic examination, the plates here shown (Figs. 1-6) merely serving to give an idea of how the work was done.

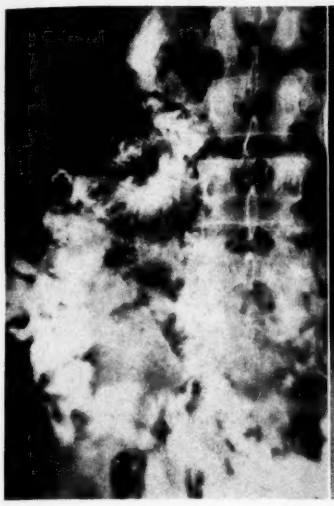

Fig. 4. Cecum of case shown in Figure 1. Time, 2 hours, 18 minutes after the meal.

Fig. 5. Cecum of case shown in Figure 2. Time, 2 hours, 42 minutes after the meal.

Fig. 6. Cecum of case shown in Figure 3. Time, 3 hours, 45 minutes after the meal.

TABLE I.—AVERAGES

(Human)

Foodstuff	Number	Weight	Height	Age	Ate (Grams)	Cecum appearing time	Stomach emptying time
Protein	6	154	5 feet, 8 inches	30	170	2 hours, 18 minutes	2 hours, 38 minutes
Carbohydrate	5	162	5 feet, 8 inches	30	176	2 hours, 42 minutes	2 hours, 37 minutes
Fat	6	164	5 feet, 10 inches	30	170	3 hours, 45 minutes	5 hours, 6 minutes

TABLE II.—AVERAGES

(Rat)

Foodstuff	Number	Weight (Grams)	Ate (Grams)	Cecum appearing time	Stomach emptying time	Small intestine emptying time	Colon emptying time
Protein	18	245.1	6.8	4 hours, 26 minutes	13 hours, 9 minutes	15 hours, 1 minute	63.4 hours
Carbohydrate	15	204.1	5.3	5 hours, 5 minutes	7 hours, 5 minutes	10 hours, 24 minutes	53.15 hours
Fat	6	235.8	5.3	8 hours, 35 minutes	16 hours, 44 minutes	29 hours, 10 minutes	61.3 hours

tine and colon. This was considered unnecessary because our previous observations, made on the emptying time of the small intestines and colons of rats, were in accordance with those of other observers.

Table II represents our previous reported results obtained in the rat experiments. In comparing the two tables we find that, in both rats and humans, the rate of passage of protein through the small intestine is fastest, carbohydrate only slightly slower, and fats decidedly slowest of all.

CONCLUSIONS

The experiments on the human subjects demonstrate that protein—in the form of casein, carbohydrate—consisting of cream of wheat, and fat—ingested as cream, all leave the stomach at approximately the same time.

The passage of protein through the small intestine of the human is much faster in every instance than fat and only slightly faster than carbohydrate. These findings in humans are similar to those obtained in our experiments with rats.

We believe that the passage rate of the food column of different foodstuffs through the small intestines of human beings is probably due to the muscular response of this organ. The rate of emptying time of the stomach seems negligible as it was demonstrated that some of the meal of the different foodstuffs passed through the pylorus at about the same time.

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Radium Rays Live Only Fraction of Second.—"A short and adventurous life of a hundred millionth of a second is enjoyed by an alpha ray from radium after being imprisoned in the nucleus of the atom for a period which may range from less than a year to one thousand million years." Lord Rutherford recently described in London the results of his long researches in radio-activity in these terms in a lecture before the Royal Institution. "Despite its hectic life after escaping," he continued, "the brief period of activity of the alpha particle has been so thoroughly studied that we are better acquainted with its character and adventures than we could ever hope to be with the character and personality of a distinguished citizen.

"The alpha particle has played a great part in the development of physics," continued Lord Rutherford. "It provided the first evidence of the transmutation of elements. . . . It first afforded the opportunity of detecting effects due to a single atom, thus furnishing, for the first time, definite proof of the truth of the atomic theory. By its aid, also, an early . . . estimate was made of the dimensions of the atom. . . . It was, moreover, by studying the scattering of alpha particles that the nuclear structure of the atom had been revealed, a peculiarity which constituted the basis of all modern views on the nature of the atom. The alpha particle had also proved invaluable in investigating the forces reigning at the heart of the atom, and had been applied with great success to the artificial transmutation of the light elements. . . .

"The nucleus of an atom constituted a minute world of its own. If an atom of radium were magnified to the size of the lecture room, its nucleus would be smaller than a pin head. . . . In some sense we might regard the nucleus as analogous to a drop of water which was held together by surface tension, but the analogy would be a very rough one. In the case of the nucleus, the surface tension of the water drop is replaced by a potential barrier of great height, through which the particles inside are unable to escape. . . . The height of the barrier at its crest might be as much as 20,000,000 volts."—*Science Service.*

PRESENT STATUS OF THE PROBLEM OF MEASUREMENT OF X-RAY INTENSITY AND QUALITY[1]

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OUR purpose in this paper is especially to stress the need for physically precise methods of measurement of X-radiation so as to render all clinical results accurate and mutually comparable. In our opinions, the presence of quantitative uncertainty in the biologic domain does not excuse the introduction of still more uncertainty in the physical domain, where precision is possible. In fact, physical precision is imperative in the measurement of the quality and quantity of X-rays given the patient before any progress in biologic precision can be hoped for. We wish also to point out a few of the pitfalls to be avoided in making physical measurements on X-radiation.

The physical measurements required fall into two groups, namely, measurements of *quality* and measurements of *quantity*. We shall consider first measurements of quality.

It is well known that X-rays form a spectrum of wave lengths. The radiation from an X-ray tube operated at, say, 200 K.V. constant potential is continuously distributed over a range of wave lengths from 0.061 down to, say, about 1 Ångström unit. The shorter the wave length, the more penetrating the radiation. If the tube is operated at a constant potential, such as can be supplied with valve tubes and condensers —or better yet with a storage battery of many cells such as the one used by William Duane in his physical researches—it is found that the radiation emitted by the tube has a sharply defined minimum wave length called the short wave limit. The tube emits no radiation harder than this limiting wave length. Moreover, this limiting wave length is related to the constant voltage operating the tube by a very rigid physical law which states that the minimum wave length is inversely proportional to the voltage. In addition to the continuous spectrum emitted by an X-ray tube, spectral lines characteristic of the material of the target are present at certain definite wave lengths. All this is an old, well-known story.

The quality of X-radiation can be roughly described in terms of its penetrating power, or effective wave length, or depth dose, but strictly speaking it is more than any of these. In this paper, when we speak of the *quality* of X-radiation, we mean the way in which the radiant intensity is distributed over the wave length spectrum. Needless to say, the quality, or spectral distribution of radiation, is a factor of prime importance in X-ray dosage.

It has been general practice to specify quality by measuring the voltage applied to the tube, specifying the filters used. This would give a fairly dependable description, provided the voltage were supplied from a constant potential source and were measured by an accurate method. In practice, however, the source of voltage is frequently a mechanically rectified outfit which supplies a very fluctuating voltage. If the mechanical rectifier is ill designed or in poor adjustment, oscillations or surges of rather high frequency occur incident to the sparking. The peaks of these oscillations correspond to a much higher voltage than the voltage actually effective during the bulk of the time. If the voltage is measured with a sphere gap, this latter will, of course, measure the highest peak of the highest

[1]Read before the Radiological Society of North America, at the Sixteenth Annual Meeting, at Los Angeles, Dec. 1–5, 1930.

oscillation and will, therefore, mislead the radiologist into the belief that his radiation is much harder than it actually is.

If all radiologists had mechanically rectified equipment, and if all the mechanical rectifiers were identical and in identically the same state of adjustment, the discrepancy I have just mentioned would cause no trouble. A radiologist might measure 200 K.V. with his sphere gap and, even if his radiation really corresponded to only about 160 K.V., all other radiologists would be able to reproduce his results.

On the contrary, many hospitals and clinics now have constant potential sources of high voltage with valve tube rectifiers and condensers. Such sources are entirely free from oscillations and supply a voltage with negligible ripple. In this case a sphere gap or other measurement of voltage will give the true voltage effective in producing X-rays and not a fictitious voltage a considerable percentage higher.

Between these two extremes the discrepancy may vary as much as 40 per cent, depending on the wave form of the voltage supply. As an example, we may cite two different hospital sets which the radiologists thought in good faith were operating comparably. One spectrogram, taken on a constant potential outfit with the Seeman spectrograph, showed radiation extending in hardness down to a sharply defined minimum wave length of 0.078 Ångström. The voltage was computed at 157 kilovolts. The other spectrogram, taken on a mechanically rectified outfit with the same Seeman spectrograph, had an ill defined short wave limit, and only a small fraction of the radiation was harder than 0.1 Ångström, equivalent to 129 kilovolts. The important point, however, is that the sphere gap on this latter set broke down at a setting corresponding to *200 kilovolts*. Part of this enormous discrepancy was due to the erroneous method of setting the sphere gap and then switching on the voltage instead of first switching on the voltage and then slowly screwing the spheres together until sparking occurs. Surges incident to switching may give excessive momentary voltages. But a great part of the discrepancy is also due to the oscillations and irregular wave form of the mechanical rectifier.

The effective wave length from the constant potential set operated at 157 K.V., 0.5 mm. of Cu and 1 mm. Al, was measured with filters and found to be about 0.16 Å., while the effective wave length from the mechanically rectified set measured in the same way was about the same although its sphere gap had indicated 200 kilovolts. The effective wave length measured with filters is thus a less misleading index of the quality of the radiation though it evidently does not tell the whole story because there is a great difference in the intensity of the radiation from the two sets in the region between 0.1 and 0.07 Ångströms.

From these and other observations we have made we conclude that it is most unsafe and uncertain to describe the quality of X-radiation merely in terms of voltage as measured with a sphere gap.

The radiologist is interested in the quality of radiation given the patient; and direct measurements of that radiation are to be preferred to indirect measurements with a sphere gap. The Seeman spectrograph in the hands of a skilled operator gives complete information as to the spectral distribution of the radiation. Depth dose measurements with a water phantom and effective wave length measurements with filters as recommended by William Duane give results that correlate well with the spectrograph.

VOLTAGE CALIBRATION WITH SPECTROGRAPH

It is possible to calibrate the voltage of a constant potential X-ray outfit very satisfactorily with the Seeman spectrograph by

making measurements of the short wave limit, because in the constant potential outfit this limit is sharply defined. We made a voltage calibration for a local hospital in this way and the departure of the individual points from the straight line was very small.

INTENSITY MEASUREMENTS

The last International Radiological Congress at Stockholm, July, 1928, has defined the roentgen unit as that "quantity of X-radiation which when the secondary electrons are fully utilized and the wall effect of the chamber is avoided produces in 1 c.c. of atmospheric air at 0°C. and 76 cm. mercury pressure such a degree of conductivity that one electrostatic unit of charge is measured at saturation current."

Using the Wilson Cloud chamber method,[2] we photographed the tracks of the fast electrons ejected by X-rays passing through air. Three photographs were made with increasingly hard X-rays, and, the harder the radiation, the longer the tracks of the fast ejected electrons. Now *small* ionization chambers are used for measuring the integrated intensity of both direct and scattered radiation in the vicinity of human tissues. In such chambers an appreciable number of the electrons ejected from the air atoms in the chamber strike the walls of the chamber before they have produced their full quota of ions. This effect is greater the harder the radiation because the electron tracks are longer. The emission of fast electrons from the walls of the small chamber into the air introduces a further complication. In three of the best dosimeters now on the market which we have examined these two effects do not compensate each other for all voltages or qualities of radiation. Because of these and other facts there is good reason to believe that it is next to impossible to build a dosimeter which will have one and the same calibration for all qualities of radiation.

We have pointed out that the quality of radiation (spectral distribution of intensity) on different types of X-ray high voltage supply is so variable that it seems infeasible for manufacturers to calibrate their dosimeters in terms precisely applicable to all sets. This means that in the present state of development of high tension generators for deep therapy the intensity measuring instrument should be calibrated at least once, and preferably periodically, against a standard ionization chamber for several voltages and filtrations *on the set with which it is actually to be used*. By the standard ionization chamber we mean a large chamber so arranged that the wall effects just mentioned are negligible. Standard chambers are suitable for calibrations of X-ray intensities only and cannot be used directly to integrate both scattered and direct radiation at a point in the vicinity of human tissues.

In the course of our work we have devised a new and simple type of dosimeter described below, which avoids many of the complications of the ionization type. With all others, however, it shares the necessity of being preferably calibrated for the set on which it is to be used.

A NEW FLUORESCENT X-RAY INTENSIMETER

About a year ago while doing some incidental work on the problem of measuring X-ray intensities we made a rather extensive analysis of the various possible methods of measurement. Searching for a simple, as well as reasonably accurate, method we set about to make use of the brilliance of the fluorescent screen as an indication of the intensity of the exciting X-ray beam. It is a matter of common experience that the brilliance of the fluorescent screen depends on the intensity of the exciting X-rays. That

[2] Water vapor is made to condense on the air molecules ionized by the fast electron so that the tracks can be photographed.

fluorescence is a very complex physical phenomenon, having a complicated law which governs the relation of intensity to brilliance, is not necessarily a drawback to the use of this phenomenon as a means of measuring X-ray intensity, since all intensity measuring devices must be individually calibrated in terms of the international standard of intensity, roentgen units-seconds.

In using the brightness of a fluorescent screen to measure X-ray intensity, we must compare this brightness with some standard luminosity. This standard of luminosity must have about the same color as the fluorescing screen and some means must be provided to compare the standard of luminosity with the fluorescent screen excited by the X-ray beam the intensity of which is to be measured. Through the use of a device somewhat akin to the optical photometer this can be accomplished. The standard of luminosity taken is a piece of fluorescent screen (cut from the same sheet as the first screen) excited by the rays from a small quantity of radium (about 2 milligrams). It was found that the color of the fluorescent light was the same in both cases. Further, the intensity of the radiation given off by radium does not vary more than 2 per cent in 20 years, and even then varies in a known and uniform manner. Since one cannot make accurate judgments about two luminosities which differ greatly in brilliance, a neutral gray filter wedge made by the Eastman Company is used in our intensimeter to equalize the two fluorescent fields, the brilliance of the X-ray screen being cut down until it matches that of the standard, radium-excited, screen. The position of the wedge is recorded by an arbitrary scale, and calibration curves (for various voltages and filters) are made up which relate the readings on this scale to the X-ray intensity as determined initially by a standard air ionization chamber. The standard screen, which is protected by a lead shield, is not held in the primary X-ray beam. The measuring screen is housed in a thin micarta tube which is water-proof and may be inserted into body cavities or a water phantom, if so desired. A photometric match of the two luminosities is made by viewing the two optically superimposed, concentric images of the two fluorescing screens through a Ramsden eyepiece, shifting the optical filter wedge until the central field is of the same brilliance as the outer field. This scale reading is then applied to the proper calibration curve and the intensity in r units-seconds is obtained therefrom.

This instrument possesses several special features which make it desirable in many cases. There are no electrical circuits involved with the insulation difficulties attendant upon measuring very small currents accurately. The instrument is compact, relatively inexpensive, and cannot get out of order easily. The standard of luminosity is the brilliance of a second fluorescent screen excited by radium, consequently it will not vary over a long period of time. The instrument can be used in any position and in a water phantom; further, it has no extremely delicate suspensions and fibers to be broken as do electrometers and galvanometers.

To verify the operation of our particular experimental instrument, we made a set of calibration curves for each particular filter and voltage setting used, relating the scale reading of the filter wedge to the intensity in r units-seconds. During the calibration of this instrument two independent observers agreed in the intensity measurements to within 5 per cent most of the time. This precision would be sufficient for most biologic dosage work, but by a special improvement in the optical system this precision can be somewhat improved, making the instrument quite adequate for general use.

CO-OPERATION BETWEEN PHYSICIST AND PHYSICIAN

Our experience in this locality in X-ray measurements has impressed us with the numerous pitfalls besetting the path of the roentgenologist who is anxious to be precise as to his dosage. The entire question of the physical measurements of X-ray intensity and quality is a delicate one even for a highly trained physicist. For these reasons, we feel that much could be gained by a more extensive co-operation between the physicist and the physician and we cannot too highly commend the practice of a few roentgenologists who employ the part-time services of a trained physicist to insure at all times an accurate knowledge of the radiation given their patients. We physicists are ready to help you if physicians will call on us.

DISCUSSION

DR. DUMOND (closing remarks): The instrument we have devised is not yet on the market and it is still under observation, but we feel that it has reached a sufficient stage of development to be of interest to radiologists. We have reason to believe that this instrument is not subject to the objection of deterioration of screens. However, except when the instrument is in use, we do take the precaution of removing the source of radium used as a standard from behind the screen on which it is supposed to act. We are continuing our tests on this particular feature.

Cosmic Riddle Solution Seen in Electricity on Earth and Sun.—Hope that "the solution for the great cosmic riddles of the world" will be found by continued careful study of such seemingly unrelated phenomena as spots on the sun, electrified atmosphere miles above the earth, radio echoes, and electricity and magnetism in and around the earth has been expressed by Dr. Arthur E. Kennelly, Professor Emeritus of Electrical Engineering of Harvard University and Massachusetts Institute of Technology. His name is linked with that of the English physicist, Oliver Heaviside, in the discovery of one of the phenomena in which he thinks the solution to the great riddles lies. It is the Kennelly-Heaviside layer of ionized, or electrified, atmosphere.

"It is found from numerous records," Dr. Kennelly said, "that the apparent height of the ionized layer is related to the strength of long-distance radio signals, such as those coming over the Atlantic ocean. Also the strength of received radio signals is found to be related to the earth's magnetic activity, as recorded photographically in a number of terrestrial magnetic observatories. This magnetic activity, in turn, is related to the conditions at the surface of the sun as revealed by sunspots. Thus, radio reception, ionized layer height, terrestrial magnetic activity, and the 11-year sunspot cycle are all correlated. Changes in one accompany changes in the others. . . . The spots on the surface of the sun are found to be associated with outpouring of ultra-violet light, and this may change the depth and density of the ionized layer in the atmosphere. This can affect radio signals, and somehow affects the earth's magnetism."—*Science Service.*

ROENTGEN EVIDENCE OF OSSEOUS MANIFESTATIONS IN SICKLE-CELL (DREPANOCYTIC) ANEMIA AND IN MEDITERRANEAN (ERYTHROBLASTIC) ANEMIA[1]

By LEON THEODORE LEWALD, M.D., Professor of Roentgenology, New York University and Bellevue Hospital Medical College, Attending Roentgenologist Willard Parker Hospital, NEW YORK CITY

MEDITERRANEAN anemia would appear to be of unusual interest to roentgenologists because of the fact that bone changes are characteristic of the disease. There are two types which have come under my personal observation: first, one in which the lesion is found in the negro race (16), being commonly associated with sickle cells (5) in the blood (Fig. 1); and second, the type commonly known as erythroblastic anemia (9), which occurs in races bordering on the Mediterranean, more particularly among the Italians and Greeks (2, 10). One case of the first type and two cases of the second type will be described, and comparison with similar cases reported by other authors is noted.[2]

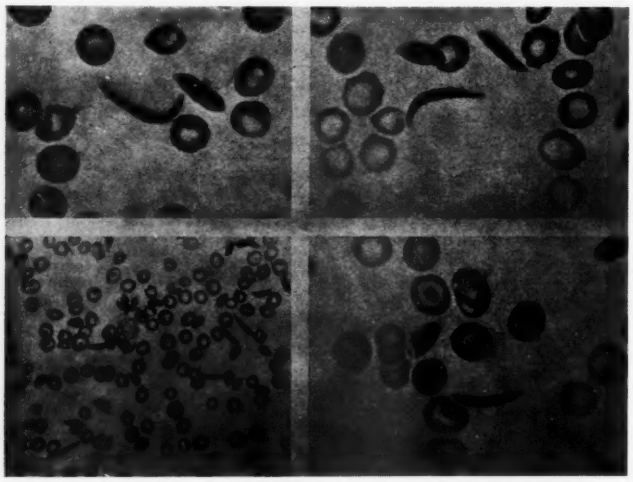

Fig. 1. Blood from a case of sickle-cell anemia (*Herrick*).

Case 1. J. R., male, aged 6 years, colored, presented a case of sickle-cell anemia. *The diagnosis in this case is based entirely upon the X-ray appearances of the skull.* This patient was referred to the X-ray Department at St. Luke's Hospital from the Out-patient Department for examination because of a lesion in the lower jaw.

X-ray Examination.—A most unusual and remarkable condition, due to the thickening of the middle and outer tables of the skull associated with peculiar radiating lines passing almost at right angles with the inner table of the skull, was revealed. The skull was approximately from one to two inches in thickness at the vertex, this thickening giving it a peculiar shape resembling that of tower skull (Figs. 2 and 3). In fact, the case was regarded as belonging to this category until a paper by Rose (10), of

[1]Read before the Radiological Society of North America at the Sixteenth Annual Meeting, at Los Angeles, Dec. 1–5, 1930.

[2]An additional case of Dr. W. Edward Chamberlain's will be reported in a subsequent issue of RADIOLOGY.

Chicago, brought to my attention the fact that this type of skull was associated with sickle-cell anemia. Dr. Rose and several

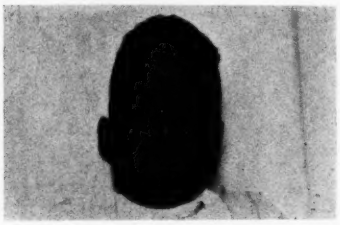

Fig. 2. Case 1. Colored male, age 6 years (for X-ray appearance, see Figure 3). This case is regarded as one of sickle-cell anemia from the X-ray appearance of the skull.

others, who have examined skulls of this type in which the blood findings have been studied, have agreed with me that this case represents one of sickle-cell anemia, although the findings have not as yet been confirmed by blood examination, and the patient has passed out of observation. I am still making efforts to trace him.

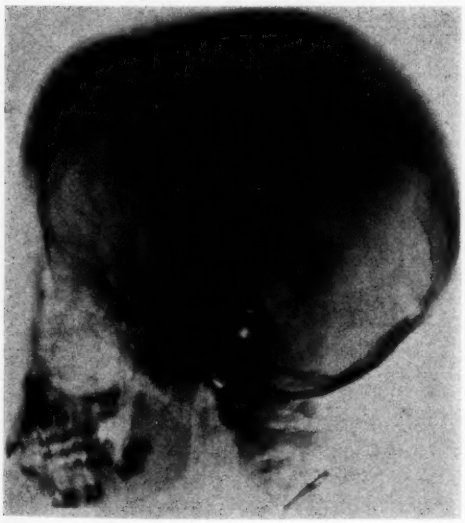

Fig. 3. Case 1. Since the skull shows enormous thickening, this is regarded as a case of sickle-cell anemia (See Figure 2).

Fig. 4. Chloroma in a male child, three and a half years of age. *Note the elevation of the periosteum in addition to the reticulated appearance of the medulla.*

Comment.—This type of lesion has been studied particularly by Cooley, Hahn, Mandeville, Rose, Sosman, Vogt, and Wollstein. In addition to the changes in the cranium, Mandeville describes irregular trabeculations in the pelvis, vertebræ, ribs, clavicles, and scapulæ. He also describes thinning of the cortex of the long bones, stating that this is an important rather constant finding, and rarefaction of the shafts of the long bones, sometimes referred to as "transparent medulla."

In distinction to the bone changes observed in chloroma, I would call attention to the fact that there are no periosteal changes in sickle-cell anemia, while, in chloroma (3),

periosteal changes, in addition to medullary changes, constitute an important radiologic appearance (Fig. 4). In chloroma there is also a characteristic separation of the suture lines of the skull along with productive

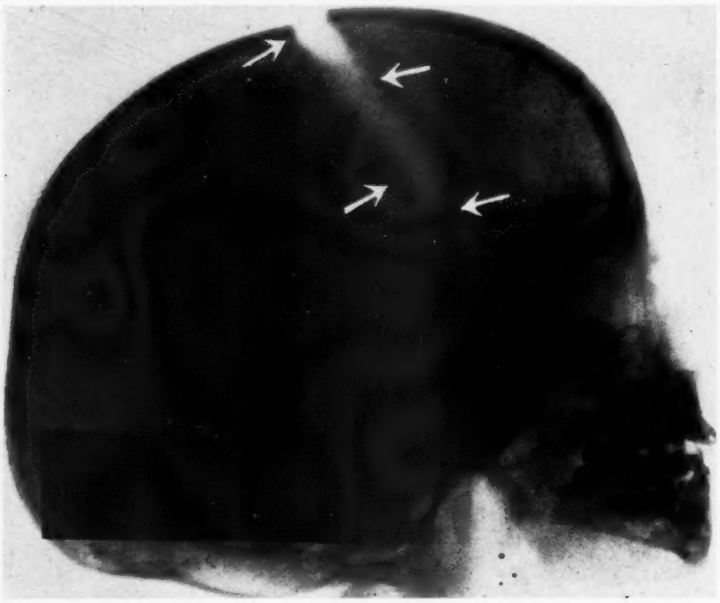

Fig. 5. Same case as shown in Figure 4. Note the separation of the sutures.

changes in other portions, such as about the orbits and temporal regions rather than the vertex (Fig. 5). The changes are easily distinguished from those seen in rickets, scurvy, and syphilis.

Case 2. N. D., male, aged 14 years, was born in New York of Italian parents, the mother coming from southern Italy. This case (Fig. 6) is one of Mediterranean anemia of the congenital type associated with enlargement of the spleen (erythroblastic anemia). The patient had been under observation six years previously on account of *enlarged spleen.* He had been given *X-ray treatment* which resulted in marked reduction of the size of the spleen and apparent improvement in his general condition. Three cousins, two males and one female (reported as Case 3) are said to have anemia.

Blood Examination (April 30, 1930).—Hemoglobin, 36 per cent; erythrocytes, 3,670,000; leukocytes, 13,000. The corpuscles showed marked anisocytosis and poikilocytosis with a few sickle-shaped forms, many normoblasts, and an occasional megaloblast. There were pronounced central pallor, basophilic stippling, and polychromatophilia. The differential leukocyte count showed: polymorphonuclear neutrophils, 48 per cent; small lymphocytes, 45 per cent; large mononuclear leukocytes, 3 per cent; eosinophils, 3 per cent, and basophils, 1 per cent.

After treatment, the blood examination showed: hemoglobin, 48 per cent; erythrocytes, 4,180,000; leukocytes, 8,000. Characteristics of erythroctyes: the corpuscles showed anisocytosis and poikilocytosis with marked central pallor, some polychromatophilia, and basophilic stippling. An oc-

casional normoblast was seen. The differential leukocyte count showed: polymorphonuclear neutrophils, 49 per cent; small lymphocytes, 42 per cent; large mononuclear leukocytes, 4 per cent; eosinophils, 5 per cent; basophils, none.

X-ray Examination.—The characteristic striations and thinning of the cortex of the long bones reported by other observers in this type of anemia (Fig. 7) were seen. The skull showed a peculiar thickening in the frontal and in the occipital region (Fig. 8). In the frontal region the bone was about one-half inch in thickness; in the oc-

Fig. 6. Case 2. Mediterranean anemia (erythroblastic type). Note the mongoloid features.

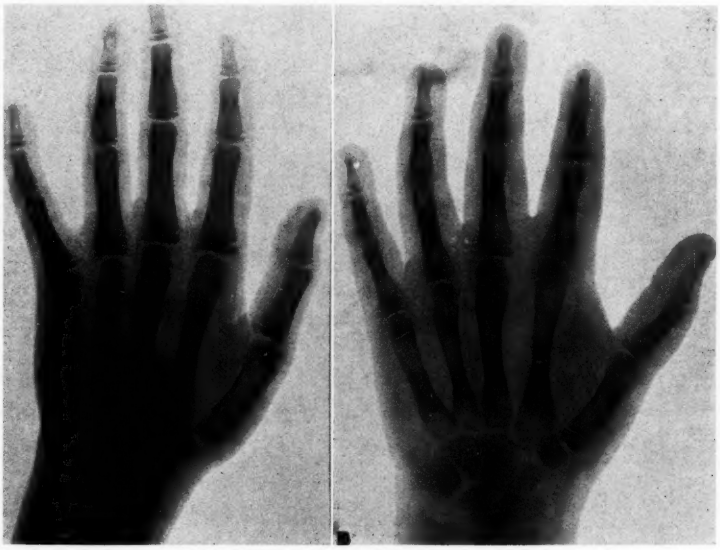

Fig. 7. Case 2. (*A*) Note the striated appearance of the medulla and thinning of the cortex. (*B*) Normal shown for comparison.

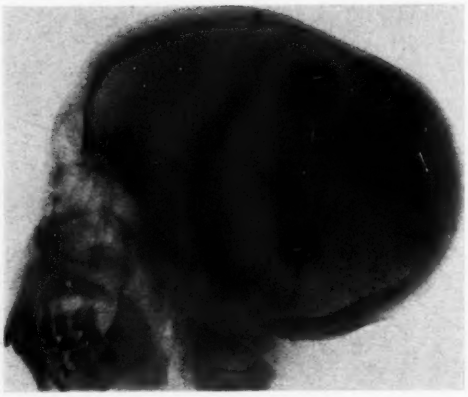

Fig. 8. Case 2. Note the thickening of the skull, with radiating lines over the vertex. The sphenoid sinuses are undeveloped.

cipital, the skull was about three-quarters of an inch thick. The sella turcica was rather small. The sphenoid and left frontal sinuses were undeveloped, and the maxillary sinuses were very small.

Comment.—This case is of particular interest in view of the fact that, whereas splenectomy has been advised in this type of anemia, the same result seems to have been accomplished by means of X-ray therapy. The patient's spleen has remained reduced in size after an interval of several years after X-ray treatment ceased.

The changes in the skull in this type of anemia offer considerable contrast to the changes found in sickle-cell anemia. The thickening of the skull is more uniform and appears to be localized to the frontal and occipitoparietal regions, rather than to the vertex. There is less evidence of striations than in sickle-cell anemia. The changes in the medulla of the long bones are particularly evident, especially when contrasted with the normal subject on the same film.

Case 3. I. D., female, aged 11 years, born in New York of parents from Southern Italy, is a cousin of Case 2 (Fig. 9). The diagnosis was Mediterranean anemia, congenital in nature (erythroblastic anemia).

X-ray Examination.—The skull showed the typical thickening characteristic of erythroblastic anemia. The thickening was particularly evident in the middle and outer tables in the frontal region where the skull measures three-quarters of an inch in thickness. The parietal region also showed thickening amounting to about one-half inch

Fig. 9. Case 3. Mediterranean anemia (erythroblastic type). This child is a cousin of the patient known as Case 2.

Fig. 10. Case 3. Note the thickening of the skull, with radiating lines over the vertex.

(Fig. 10). There was fairly well marked striation at right-angles to the inner table of the skull in the thickened area in the frontal region. The sphenoid sinuses were undeveloped. The sella turcica was of average size. In the long bones examined, the cortex was thinned and the medulla striated. Similar changes were noted in the small bones of the hand, being particularly evident in the metacarpal bones of the thumb (Fig. 11).

Comment.—This case is of particular interest in view of its familial type, showing its congenital nature.

Fig. 11. Case 3. Note the striated appearance of the medulla and thinning of the cortex.

CONCLUSIONS

1. Mediterranean anemia shows characteristic changes in the bones of the skull and other portions of the skeleton.

2. In the negro, the disease manifests itself as sickle-cell anemia, being characterized by involvement of the vertex of the skull, which shows at times enormous thickening in the form of radiating lines at right-angles to the inner table of the skull.

3. Erythroblastic anemia occurs in white children of Mediterranean parentage, especially in Italians and Greeks. The roentgen findings show characteristic changes in the skull, consisting of thickening, especially in the frontal and occipito-parietal regions.

4. In erythroblastic anemia associated with enlargement of the spleen and liver, roentgenotherapy is an exceedingly valuable method of treatment and may give as satisfactory and permanent a result as splenectomy.

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Lists Eight Forerunners of Cancer of Digestive Tract.—Eight conditions of injury or degeneration which occur in the digestive tract before the development of cancer have been listed by Prof. Matthew J. Stewart, of the University of Leeds, in a series of lectures delivered before the Royal College of Physicians.

"At the present time it is probably true to say that the most hopeful side of cancer research is that concerned with the demonstration of local causative factors, and the recognition and prevention of precancerous lesions of one kind or another," Prof. Stewart declared at the beginning of his first lecture.

"Unfortunately it is to the more superficial forms of malignant disease, a very small fraction of the whole, that this principally applies."

Conditions of the digestive tract that may develop into cancer are not so definitely known as precancerous conditions elsewhere in the body, Prof. Stewart pointed out, nor are the opportunities so good for preventing cancer of the digestive tract.

In one year there were 56,896 deaths from cancer in England and Wales, according to the official figures he quoted. Of these, over half in men and nearly half in women were referable to the digestive tract.

Prof. Stewart divided the chief precancerous conditions into three groups. The first consisted of chronic inflammatory conditions, such as sores due to burns and chemical caustics; cirrhosis of the liver; certain diseased conditions of the gall bladder; chronic stomach ulcer; chronic inflammation of the stomach; chronic duodenal ulcer, and three conditions less well-known to the layman, diverticulitis, hemochromatosis, and leukoplakia. The second group consisted of simple tumors which may be forerunners of cancer. The third group consisted of sores or injuries due to animal parasites.—*Science Service.*

THE PRESENT STATUS OF APPENDICEAL DIAGNOSIS[1]

By ROY A. PAYNE, M.D., PORTLAND, OREGON

THE papers on appendiceal pathology, in 1886, and the reports of the first operation for the removal of the appendix, in 1887, had far-reaching effects. The spectacular results in a certain percentage of the cases led to operations for acute or chronic appendix for a wide range of abdominal symptomatology, either real or imagined. The inevitable reaction followed and the pendulum swung far back until operation for any except acute appendices was condemned. The diagnosis of chronic appendicitis was disputed by many surgeons. There must be a calm or a cyclone—no gentle breeze was tolerated.

My work in diagnosis began at a time when, of patients entering the clinic in which I worked, nearly 50 per cent had previously had their appendices removed. At least one-half of these had received no admitted benefit from the operation. Routine X-ray examinations of 6-hour and immediate meal, 24-hour, 48-hour and enema, revealed few appendices outlining. Naturally we accepted the prevalent view and in those early years I remember only two diagnoses of appendicitis being made.

Yet from time to time reports filtered back of patients who had suffered removal of ruptured appendices at later dates. Rechecking of our records revealed no sure criterion for a diagnosis. Upon seeking the opinions of others on this subject which was of tremendous interest to us, we found a wide variation of opinion among roentgenologists. I well remember a discussion in which I was interested to hear one roentgenologist maintain that all appendices which did not outline were pathologic and should come out. His opponent was equally certain that any appendix that did outline was pathologic and should come out. We decided that more work was necessary before the subject could be closed.

Our efforts to obtain evidence redoubled. More careful and more frequent screenings of the emptying cecum revealed filling in the majority of appendices. Careful palpation discovered tenderness often appearing at a screening although it had been absent on previous exposure. In some cases this pain was referred to the region of the solar plexus and the patient compared it to digestive discomforts that had been complained of in his history. At about this time A. L. Gray, M.D., of Richmond, Virginia, reading in Washington, D. C., on "Cyclic Vomiting in Children," traced the etiology to the appendix. He stated his belief that children showing an appendix with an emptying time of over 100 hours had a pathologic appendix. In cases in which the appendix was removed, the patients were relieved of the vomiting.

Rejoicing that this work in children coincided with our studies of adults, we continued our investigation. In checking the literature we found a gradually increasing number of articles on this subject. The reason for this is well set forth by Gatewood (3), who states:

> Despite the enormous literature on appendicitis, the recent statistical reports show an increasing mortality. The reasons for this are not at once apparent but, in looking over new cases, we have been struck by the fact that mortality occurs chiefly at the two extremes of life. The seriousness of appendicitis in children has been well recognized, but there has not been so much observed about appendicitis in the aged. Moes, discussing the subject at the Louisiana Medical Society, gave a mor-

[1]Read before the Radiological Society of North America at the Sixteenth Annual Meeting, at Los Angeles, California, Dec. 1–5, 1930.

tality of 29 per cent in patients over 50 years of age. E. M. Fitch, in 1928, reported the results of a questionnaire covering 6,548 cases. The average mortality rates in institutions replying to his queries averaged from 1.9 to 9 per cent. In patients over 50 years of age, the death rate averaged from 19 to 50 per cent.

In his series at the Claremont, North Hampshire, Hospital the mortality was 21.6 per cent in patients between 50 and 60 and 54 per cent in patients between 60 and 70. Part of the high mortality is attributed to the lowered resistance of the patients. Much more, however, can be explanied upon the basis of errors in diagnosis and upon pathology peculiar to these older individuals. Lehman reported six cases from the Virsorginshien, in Lains, calling attention to this atypical picture; and Erdheim, in his pathologic conferences at the same institution, has frequently demonstrated autopsy specimens of old persons dying of unrecognized appendicitis with resultant peritonitis.

I wish to present an analysis of findings in 256 cases, taken from a series of 4,500 case records in private practice, in which appendiceal pathology has been demonstrated. Our observations of the appendix are listed under: (1) Abnormality in position, (2) Tenderness, (3) Stasis, (4) Non-filling, (5) Abnormal outlines and adhesions. While this research has been developed independently, we make no claim to originality in this matter. Bird (1), 1928, stated and illustrated beautifully the majority of these points. He says:

In following up a number of cases in which I had reported what I believed to be a pathologic appendix, and in which the surgeon had agreed with the diagnosis and performed an appendectomy, a correlation of the findings has led me to consider that an appendix having any of the following characteristics is probably pathologic:

(1) Retrocecal and bound down by adhesions.

(2) Adhesions holding the tip in a fixed position.

(3) The presence of sharp kinks or loops that are constant and cannot be smoothed out under the fluoroscope.

(4) A constriction of the lumen at the base, with a bulbous tip.

(5) Pressure tenderness over the appendix, changing with change in position of the cecum.

(6) Retention of barium in the appendix after the cecum is empty.

It is to amplify this and to study further relationships that we undertook our inquiry.

Let us review the causes of the first of these conditions. Accidents to the cecum naturally affect the appendix and, conversely, accidents to the appendix may affect not only the appendix but the position and the function of the cecum. Whether the pathology present in these instances is the result of early inflammations or mere accidents of growth is open to question. Certainly the demonstration of the altered position is most important to the patient, as, knowing it, any physician who sees the patient during an acute attack may much more easily obtain a diagnosis in the presence of atypical symptomatology, and the surgeon at operation may incise to fit the altered anatomy. Relationships to other organs are much altered. Altered positions must result in changed lymphatic drainage. In our experience gallbladder and duodenal pathology seem much more frequent in these cases.

Again, in the matter of stasis, anatomic conditions are involved. Andresen (2) states:

Several anatomic facts in regard to the appendix must be borne in mind to understand its physiologic and pathologic behavior. In the normal appendix, the mucosa is ciliated, with the action of the cilia directed towards its outlet; its muscular coat is fashioned for contraction in the same direction and the valve of Gerlach at its outlet acts to prevent regurgitation of cecal contents into the appendix. It is,

therefore, evident that the appendix is supposed to empty itself of its contents, but is not supposed to be invaded by the contents of the cecum. It also seems reasonable to suppose that contractions of the cecum, induced by the entrance of material from the ileum, play a part in stimulating the appendicular contractions.

. . . A considerable ileal residue twenty-four hours after a barium meal, when not due to a prolonged gastric retention, is indicative of some pathology in the ileocecal region and further study of the ileum at one-hour intervals following the barium meal may show that this pathology is a narrowing, dilatation, or deformity of the ileum due to kinks or inflammations so frequently associated with appendix adhesions.

In attempting to get some reasonable basis upon which to interpret this factor of stasis in the appendix, we have followed the cases in some instances for as long as 32 days and have observed the relationship of stasis to pathologic findings at the time of operation. We are inclined to think that if Gray had continued his observations he would at present possibly lower somewhat his 100-hour limit for normal appendices in children. From our observations we would feel that, in the adult, an appendix which remains filled over this time should be considered as pathologic. When we think of the absorption factors in this narrow-lumened organ, it is evident that any fecal material remaining in here for that period must necessarily bring about the possibility of an inflammatory reaction. Particularly is this true when we consider that the cecum is probably the site of the most virulent bacteria growth of any part of the bowel.

Of the cases 197, or 77 per cent, show tenderness; 136, or 53 per cent, show stasis of from 100 to 700 hours. Next to tenderness this is the most frequent finding. In all, 65 cases, or 25 per cent of the total, were found in an abnormal position. This is enough to indicate the opportunities for not visualizing except by most persistent and painstaking study.

We were ourselves somewhat startled to find no cases in this list which we were able to diagnose as appendiceal pathology when there was absence of filling. To us this emphasizes the fact that a very great percentage of appendices will fill at some time if closely watched.

The grouping together of adherent appendices and abnormal outlines seems fitting to us. This group will include enteroliths, narrowed lumen, sharp, fixed angulations, and dilatations. The appearance of these in 35 cases, or 13 per cent, is rather understating the frequency of these findings.

We have records of operative procedure in 30 cases, or 11 per cent. Doubtless numbers of others have undergone surgery. Even if double this number, it would but emphasize that these findings are essentially medical in the majority of cases.

Of related diagnostic points many are briefly discussed. The most important of these is the presence of 157 cases of colon stasis. The relationship of constipation to appendiceal tenderness is so clearly evident that in those cases in which tenderness is present without colon stasis we are much more inclined to advise immediate surgery.

Gall-bladder pathology was present in 61, or 24 per cent of the cases; duodenal pathology (ulcer, persistent spasm, banding), in 52, or 20 per cent, and stomach pathology in 9, or 3 per cent. The frequently related pathology in the old triumvirate of appendix, gall bladder, and duodenum seems well borne out.

Though we find many appendices without gall-bladder or duodenal pathology, it is indeed seldom that we find the latter two present without evidences in the appendix of old, if not present, trouble. We believe it is in this right lower quadrant that the majority of the trouble with the gall bladder, at least, has its start.

Colitis diagnosed in 10 cases, or 4 per cent, is perhaps leaning backward. So strong is our impression that these irritations of the colon mucosa are frequently secondary to periodic passing of irritating bacteria from the gall bladder or appendix that we diagnose colitis only when anatomic changes show the walls and mucosa so altered that pathology is self-sustaining there, independent of the original source of infection.

Dental sepsis was present in 44 cases, or 17 per cent. Tonsil (nose and throat) sepsis was present in 105, or 41 per cent. This last seems of particular moment to us. The resemblance between the adenoid tissue in the tonsil and that of the appendix has been frequently marked. The frequency with which appendiceal flare-up, often of most serious character, follows a cold and tonsillitis, is striking.

Pelvic pathology was diagnosed in 38, or 15 per cent. Not only does trouble in this quarter cause conflicting diagnoses but frequently the varying blood supply in pelvic pathology actually incites appendiceal irritations.

We note nervous and mental complications in 8 cases, or 3 per cent; thyroid abnormality in 32, or 13 per cent, and lung pathology of varying degrees in 73, or 29 per cent. Of more direct interest here is the appearance of ileac regurgitation in 26, or 10 per cent. In a considerable percentage of cases this is due to distortion of the ileocecal valve by inflammatory adhesions. Evidence of bands about the cecum or ileum is present in 76 cases, or 30 per cent.

Pathology of the urinary tract appeared in 34 cases, or 13 per cent. We are convinced that more careful study over large numbers of cases will demonstrate relationship between appendiceal pathology and pus conditions in the kidney pelvis. We have seen one case, which required frequent irrigations of the kidney pelvis, while carrying an appendix with a 300-hour stasis, live for two years without serious kidney trouble after an appendectomy.

Blood changes occurred in 20 cases, cardiospasm in 1, arthritis in 11, and cardiovascular affections in 14 cases.

Changes in blood sugar occurred in 12 cases. This is of interest in the light of the discussion by surgeons and clinicians of the value of removal of the gall bladder in diabetic cases. Our impression is that the gall bladder should be removed, when possible, in the presence of definite sepsis, as is the tonsil. But we do feel that before this is done the appendix should be evaluated roentgenologically and removed at operation if the X-ray examination shows pathology, no matter what its appearance is to the surgeon.

Skin complications in 2 per cent of the cases are small numerically, but the relationship between appendiceal stasis and acne vulgaris should have widespread study. In some cases the factor causing skin sensitiveness to low-grade infection may be, as in at least two of my cases, related to prolonged appendiceal stasis.

We agree fully that tenderness is the most important sign to be elicited in a study of an appendix. But when Lahey (4) says, "X-ray evidence as to the possible presence of chronic or recurrent appendicitis is limited in our opinion to tenderness directly over the appendix by fluoroscopy," he is speaking for the surgical appendix.

It is full time for surgeons and internists to realize that there is appendiceal pathology which is subject to medical treatment. Bowel regulation alone will help many. Often as we study these cases we wonder how much relief in the colon stasis cases has been from coincident relief of appendiceal symptoms. Relief from associated sepsis will aid and, in a considerable percentage of cases, avoid acute inflammatory reactions.

The evidence obtainable can be of greatest value in determining expediency of opera-

ANALYSIS OF 256 CASES WITH DIAGNOSIS OF APPENDICEAL PATHOLOGY

1.—Appendiceal Findings

Number of cases	Abnormal position	Tenderness	Stasis	Non-filling	Adhesions and abnormal outlines	Surgery
256	65, or 25 per cent	197, or 77 per cent	136, or 53 per cent	0	35, or 13 per cent	30 and 2 post-operative, or 11 per cent

2.—Associated Diagnosis

Colon stasis	Gall bladder	Pathology involving duodenum	Pathology involving stomach	Colitis	Septic teeth	Nose and throat sepsis	Pelvic pathology
157, or 61 per cent	61, or 24 per cent	52, or 20 per cent	9, or 3 per cent	10, or 4 per cent	44, or 17 per cent	105, or 41 per cent	38, or 15 per cent

Nervous and mental	Thyroid pathology	Lung	Ileac regurgitation	Bands about cecum and ileum	Urinary tract pathology
8, or 3 per cent	32, or 13 per cent	73, or 29 per cent	26, or 10 per cent	76, or 30 per cent	34, or 13 per cent

Neuritis	Blood	Diverticulum	Cardio-vascular	Arthritis	Blood sugar abnormalities	Skin
0	20, or 7 per cent	4, or 1 per cent	14, or 6 per cent	11, or 4 per cent	12, or 3 per cent	7, or 2 per cent

tion when other factors are present. For instance, the question of surgery or medical treatment, and the best method of approach in surgery, may well be affected in a tubal infection when appendiceal pathology is present roentgenologically. Double surgery may often be avoided if this study is made. Listed abnormalities in the position of the appendix clarify questionable symptomatology and alter the optimum site for surgical approach. Careful study and record of pathologic appendices will be of tremendous value in determining the etiology of some obscure disease complications.

Frankly, appendiceal pathology is too important to be buried under the opprobrium attached to the term "chronic appendicitis." Roentgenologists alone can evaluate the condition of the organ. Let them select the term to apply to the finding so that the internist will understand there is need of care in the line of his efforts. Let it be a term that the surgeon can hear without reaching for his surgical kit.

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DISCUSSION

DR. LEWALD (New York): There are two things in particular I wish to speak of. One is the length of time that opaque material may be observed in the appendix. Dr. Payne called attention to one case of 300 hours—I have one case of about 3,000 hours. The second point bears directly on retention and if that long-retaining appendix would necessarily have had to be removed. That appendix I cite has not been removed. The patient has given more attention to the bowels, and the attacks she had had previously have not recurred, so far as I can find out, in over two years.

There are two extreme displacements of the

appendix that were not mentioned by Dr. Payne, but they are very pertinent.

A very short time ago, a surgeon operated in the usual way on a child of about 10 years of age for supposed appendicitis. No X-ray examination had been made and it was found on operation that there was no appendix in the usual location. The surgeon naturally surmised that there was an appendix somewhere in the abdomen, enlarged his incision, and brought it out from the *left* side. I made an X-ray examination of the child afterwards and found a complete *transposition of the viscera.* But the little girl who did not need to have her appendix out at all now has a scar.

I asked her about her symptoms when I saw her later. So far as I could figure out, she had what we ordinarily speak of as "congestion of the spleen" or a "stitch in the side," in her case her spleen being on the *right* side. I asked her if she had this trouble any more and she said, "Yes, when I run, I feel the same old pain on my right side." So I presume this bears out the fact that it was her spleen and not the appendix.

The other type of lesion is the *non-rotation of the colon* which brings the appendix to the left side. I saw one case operated on for a supposed duodenal ulcer or adhesions to the gall bladder in which a series of films were made of the upper right side of the abdomen alone, but in that particular case the appendix was on the left side and very low down. The surgeon, after exploring, thought he would reach down and see if he could find the appendix, but he could not, and so he had to close up *without* removing the appendix. There were no adhesions about the duodenum. I mention this because, there being no transverse colon and no complete U-shaped duodenum, the duodenum runs a peculiar course —it does not loop down, but shoots straight out to the right, looking as if it were fixed by adhesions to the gall bladder.

Dr. Payne (closing): During the meal, we sometimes find that an appendix which has not filled before will fill when the opaque enema is taken. We usually screen those cases 48 hours after the enema. As a rule I find it is better, when we have been working with an appendix of this kind, to terminate the work with a plate. Oftentimes the image is so faint that one is unable to pick it up with the fluorescent screen, and so I think it is safer to plate the right lower quadrant and check up for the position of the appendix in this way.

We list segmentation simply under the abnormal appearance and barium stasis, being prone to judge the importance of this finding by its associated symptomatology.

Dr. LeWald has surpassed us on the length of his emptying time. As I stated, we watched one boy's appendix for thirty days and his appendix was still filled at the end of that time. We advised operation, but the patient put it off. A month or so later, the condition flared up in the middle of the night, demanding emergency surgery.

HEREDITY OF CANCER[1]

By MME. N. DOBROVOLSKAÏA-ZAVADSKAÏA, M.D., PARIS

IT is rather difficult to speak on the heredity of cancer in this country, where such a great deal of work concerning this subject has been done. But the problem is so complex and so important that, I believe, any new material is of interest.

Our research on cancer heredity was started in 1927, by establishing a few isolated strains of mice, descending each from a cancerous mother. We are endeavoring, of course, to eliminate all possible causes of cancer, except heredity, to keep the mice as clean as possible, and to create for them conditions as hygienic as can be attained with animals.

Professor Borrel, in France, insists, as you know, on cancer in mice being produced by a small worm (*filaria*) *Muspicea borreli,* which he found in his stock and which he supposes to be a conveyer of an invisible virus, a real cancerigenic agent.

In order to find out whether or not our cancerous mice carry this filaria, we examined 40 of our cancerous stock (among them were two normals taken for control), following exactly the method of cleavage of Professor Borrel, and found this worm in only five cases, that is, in 13.2 per cent of all cancerous animals examined. It means that about 87 per cent of our stock develop their tumors without any influence of that parasite, whereas Professor Borrel reports them to be present in his stock in from 80 to 90 per cent of all cancerous mice. The difference between our results and those of Professor Borrel is probably to be explained by the greater attention we pay to the hygienic conditions of our stock.

Small nodules in the mammary glands, supposed by Professor Borrel to be due to irritation produced by *Muspicea,* are rather characteristic of adenocarcinomatous condition in general. In the cases of sarcomas, nodules were not found in the mammary glands, even in the presence of *Muspicea.*

Our breeding experiments are far from being concluded, but two strains of mice presenting a striking difference are nearly ready and their preliminary results may be reported now.

Strain No. 5 (Chart II) was originated by a female having an ordinary adenocarcinoma of the breast and was continued by inbreeding until the third generation. The general result of this strain may be summed up as follows: out of 125 males, six developed epithelial tumors of a glandular type, and five developed sarcomas. Out of 114 females, 66 developed epitheliomas—in which there were 64 adenocarcinomas of the breast—and six developed sarcomas.

Strain No. 4 (Chart I) was originated by a female having a very rare tumor, reproducing in the most typical points the structure of hair follicles and known under the name of Borrel-Haaland's tumor. This female, fecundated by an unknown male, gave birth to a litter of three females which developed cancer, and two males, one of which developed a sarcoma. The whole second generation was produced by three cancerous sisters mated to one sarcomatous brother, the reproduction being stopped with the third generation.

On the whole, this strain consisted of 242 animals. Out of 125 males, five developed sarcomas, and two, epitheliomas. Out of 117 females, 16 developed sarcomas, and eight, epitheliomas, among which were only three mammary adenocarcinomas.

If all kinds of cancers were controlled by

[1]Read before the Radiological Society of North America at the Sixteenth Annual Meeting, at Los Angeles, Dec. 1–5, 1930

the same gene as a simple mendelian character, recessive to normal condition, such a combination as given in this strain (three cancerous sisters mated to a sarcomatous brother) should produce only cancerous descendants. In reality, the numbers obtained are too small for cancer, being of a simple mendelian character, either dominant or recessive. A premature mortality cannot explain this deficit because there were many animals which lived sufficiently long and died without cancer. The only assumption which can account for the results of Strain No. 4 is that there are different genes for sarcoma and for epithelioma, both recessive to normal condition.

Some other peculiar conditions as angiomas, angiomatous cysts of the ovaries, a kind of rodent ulcer, cystic kidneys, etc., were observed in the same strain.

Since the majority of these conditions are generally not considered as malignant tumors, and as their relation to cancer, especially from a genetic standpoint, is not yet quite clear, the full interpretation of the results of this strain is not yet possible. But there is a point which is quite evident, that is, a profound difference exists between the two strains (Charts I, II). This difference becomes apparent if we consider the most common tumor in mice, *i.e.*, cancer of the breast. There are 64 mammary adenocarcinomas in 114 females of Strain No. 5, and only three such tumors in the 117 females of Strain No. 4. This difference cannot be explained by any external conditions, because these were exactly the same for both strains, and in some instances the animals even lived together in common cages. The causes of this difference may be sought only in intrinsic conditions, most probably hereditary, and, primarily, in the histologic structure of two initial tumors: one was an ordinary mammary adenocarcinoma, and the other, a very rare tumor of a special structure, reminding one of the hair follicles.

The observations just reported, incomplete as they are, seem to allow the following preliminary conclusions:

1. There is evidence in favor of a hereditary factor in the origin of cancer and, perhaps, neoplastic diseases in general.

2. The different histologic types of tumors are probably dependent on different genes in germ plasm.

3. All kinds of irritations, chronic inflammation, etc., contribute to the development of cancer in predisposed organisms and determine its localization.

CHART I.—STRAIN NO. 4, TUMOR BORREL-HAALAND

	Normal	Sarcoma	Epithelioma	Totals and tumors (per cent)
Males	118	5	2	125 = 5.6%
Females	93	16	5 + 3	117 = 20.5%
Totals	211	21	10	242 = 12.8%

CHART II.—STRAIN NO. 5, ADENOCARCINOMA OF THE BREAST

	Normal	Sarcoma	Epithelioma	Totals and tumors (per cent)
Males	114	5	6	125 = 9.6%
Females	42	6	2 + 64	114 = 63.2%
Totals	156	11	72	239 = 34.7%

DISCUSSION

DR. EMIL G. BECK (Berkeley, Calif.): Has the Doctor ever observed that carcinoma and sarcoma co-existed in the same animal? In the human being this is very rare; there are only a few cases reported in the literature. I have never seen a case myself, and I have asked a good many of my confrères but they cannot remember that such a case has occurred in their practice.

We know that sarcoma affects principally the young and carcinoma the elder people.

There seems to be in the human body some antagonism of one for the other. We know that the average age of a case of carcinoma is about 48 years and that of sarcoma is about 28 years, and that most of the cases of sarcoma, about 34 per cent, occur between the ages of 11 and twenty.

I would like to know if, in any of these animals, the two diseases occurred in the same animal?

DR. J. E. GENDREAU (Montreal): I would like to ask Dr. Zavadskaia if the conditions under which she bred mice were the same as those used by Maud Slye; if the presence or absence of secondary factors in producing the cancers could explain a difference in the results, and if these secondary factors were very important in the production of cancer?

DR. LEON MENVILLE (New Orleans): The question of cancer heredity is a subject of great importance. Dr. Zavadskaia has exemplified the possibilities of heredity in the production of cancer. The work of Dr. Smith, of the Department of Agriculture in Washington, is also quite interesting. By the use of certain bacilli, Dr. Smith has produced tumors in the vegetable kingdom, particularly in the beet and castor plant, analogous to cancer tumors. The injection of this bacilli will produce the parent tumor with metastasis in other parts of the plant. The microscopic section of these tumors is similar to the malignant tumors in the human. Therefore, it would seem somewhat convincing that the micro-organism theory could play a part in the production of cancer. The heredity theory is also convincing, especially after listening to such an eminent authority as Dr. Zavadskaia.

DR. H. J. ULLMANN (Santa Barbara, Calif.): After reading it, one will have to think this paper over for some time to appreciate the problems involved and the possibilities of the findings.

In evaluating any such reaction as has been described, one must compare the evidence and the data presented with a formula or equation which must be integrated, in which all the factors are variables. Doctor Zavadskaia had demonstrated the selective action, and one can, therefore, say that the type of cell is one of the factors that is a variable. Let me suggest another variable: the metabolism as a whole, and perhaps, also, the metabolism or type of cells surrounding the tumor being treated. We must, also, take into consideration the time intensity of the irradiation, another variable, and perhaps, in addition, the wave length of the irradiation. I have felt for some time that the wave length might be a factor to be considered in spite of Arndt-Schulz's well accepted law.

Regaud has shown that, the shorter the wave length, the more selective the action of the irradiation. Moffatt, in the *Medical Journal of Australia*, April 11, 1930, presented a very interesting piece of work. He showed the varying effects of different wave lengths on the egg membrane of eight-day chick embryos. He found complete atrophy at 0.11 Ångström, 0.53 and 0.79. The effect was sharply restricted to these wave lengths, the greatest atrophy being found at 0.11 and the least at 0.79. An extensive myxomatous change occurred at 0.16 Ångström; apparently it was a characteristic response to that wave length. Hypertrophic nodules occurred, this effect being most pronounced at 0.63 Ångström. A leukocytosis had its chief effect at 0.32 and again at 0.34 Ångström. Epithelial stimulation was most definite in this reaction. Some stimulation in all was found, but the peak was at 0.16 Ångström and again at 0.89, where it was enormous. At this point it was almost like a carcinomatous growth. At 0.84 Ångström, the epithelium was invaded by leukocytes. The atrophy was so sharply confined to certain wave lengths that Moffatt feels that other effects than the electron effect must occur. As 0.11 Ångström was so much shorter than the characteristic radiation of any element present, he suggests that the effect is on an inner electron and relatively close to the nucleus.

Of course, in most of the tests so far made, portions of the spectrum relatively close together have been used, and, in looking for

the selective effects of different wave lengths, we must compare very short and very long wave portions of the spectrum. I believe that the wave length effect must be taken into consideration in at least certain parts of our work.

DR. ZAVADSKAIA (closing): In replying to Dr. Beck's question, if there is coincidence of both tumors, sarcoma and epithelioma, I might say there is, but very rarely in mice.

Sarcoma in humans is a malignancy of the young; in mice it is rather a tumor of old age, even older than adenocarcinoma of the breast, because adenocarcinoma was generally developed between six and eighteen months, and sarcoma was mostly developed at two years of age and even later (once, at two years and eight months). Therefore, you see, the tumor age is different in different species. If we admit that there are two different genes for sarcoma and epithelioma, the coincidence of both of them in one animal is probably very rare.

To reply to Dr. Gendreau's question about the rôle of external conditions. Miss Maud Slye and I try to put our animals in the best possible conditions to eliminate all causes of cancer but heredity. But there may be some kind of parasite which escapes us, and this is one of our next problems to study. It is very probable that other causes, an irritation, for instance, may develop cancer only in predisposed animals. The demodex, very common on the skin of man, is very rarely the real cause of cancer. All this calls for further research.

I know Dr. Smith's experiments; but I know, also, other facts, for instance, the experiments in plants, of Dr. Kostoff. He obtained real tumors in the Nicotiana hybrids by crossing different species which, as pure lines, never developed a tumor. He examined these tumors and did not find any microbe there. It is probable that microbes play a part in certain plant cancers. But you cannot easily transfer the results obtained in plants to animals; even in mice, sarcoma and epithelioma behaved differently, as you have seen it, and probably we have to deal with many different kinds of cancer.

Tumors in hybrids are now being studied by Dr. Reed and Dr. Gordin in the Zoological Department of Cornell University. They have found tumors in hybrids of small Mexican fish. I do not remember the name of this fish, but when I visited them they showed me these animals. Hybrids developed a very malignant pigmented tumor, a kind of nevosarcoma which kills the animals.

So you see how complex is the problem and there are different approaches to the study of it. Perhaps these tumors in hybrids are also indications that the hereditary factor plays an important part in the development of cancer.

Urges X-ray Diagnosis of Children's Teeth.—Full X-ray examination of the mouths and teeth of young children has been urged by Dr. Leo J. Schoeny, of New Orleans, before the American Dental Association.

"Recent developments in X-ray apparatus render it possible to make such examinations even upon very small and nervous children," he said. "Such examination will enable the dentist to discover dental defects and disorders at an early age and to prevent their further development and more serious consequences, such as malocclusion, pyorrhea, and dental caries. . . . By means of the X-ray diagnosis on small children, the dentist shall be in a position to contribute his full share toward preventive dentistry and medicine."—*Science Service.*

MEDICO-LEGAL DEPARTMENT

CONTRIBUTIONS[1] BY I. S. TROSTLER, M.D., CHICAGO

UNNECESSARY ROENTGENOSCOPY NOT REQUIRED

(United States Fidelity & Guaranty Co. *et al. vs.* Wickline (Neb.), 170 N.W.R. 193)

The Supreme Court of Nebraska holds that a claimant for compensation under the employers' liability act pursuant to Section 3675 of the Revised Statutes of Nebraska of 1913, cannot be denied a recovery because of a refusal to submit to a roentgen-ray examination or to have a roentgenogram taken of the person, where the uncontradicted evidence shows that neither was necessary. Section 3675 provides that, after an employee has given notice of an injury he shall, if so requested by the employer or the insurance company carrying such risk, submit himself to an examination by a physician or surgeon furnished and paid for by the employer or the insurance company, and refusal of the employee to submit to such examination shall deprive him of the right to compensation during the continuance of such refusal. The court says that under the statute the request for an examination must be reasonable, and it did not appear to have been in this case. The testimony before the court showed affirmatively that neither a roentgen-ray examination nor a roentgenogram was necessary. No physician nor other person testified that either was necessary, nor did it appear that a request was made to the court to require the employee to submit to either. In the present advanced state of the science of roentgen-ray examinations and the taking of roentgenograms of the person there appears to be no reason why such examination or roentgenogram should not be permitted by a claimant for compensation under the employers' liability act, on request by the employer or insurer, unless the request is shown to be unreasonable.

BARS TESTIMONY AS TO WHAT ROENTGENOGRAMS SHOW

(Lang *vs.* Marshalltown Light, Power & Railway Co. (Iowa), 170 N.W.R. 463)

The Supreme Court of Iowa holds that there was no error in a ruling in this personal injury case sustaining objection to questions such as one asking a physician to state whether or not a certain roentgenogram did, or did not, show a curvature of the spine, as appeared in the negative. The Court says that the defendant cited a number of cases to the proposition that roentgen-ray negatives and photographs, properly verified, are admissible in evidence, and this proposition was not disputed by the plaintiff. Cases were also cited by the defendant, holding that it is proper for experts to interpret and explain roentgen-ray plates to the jury. Among these was the case of *State vs. Matheson,* 142 Iowa, 414, 120 N.W. 1036. It was claimed, too, that some of the cases hold that a witness may testify as to what the photograph shows. But the court thinks that the questions asked in this case, and the ruling thereon, were within the ruling of *Elzig vs. Bales,* 135 Iowa, 208, 112 N.W. 540, wherein it was said, in effect, that, as demonstrative evidence, roentgenograms serve to explain or illustrate and apply the testimony, and are aids to the jury in comprehending the questions in dispute. When taken for either purpose they are the best evidence of what appears on them. The rule exacting the best evidence applies to the testimony of experts, as well as to that of other witnesses, and it was error to permit a physician to testify to what appeared in a roentgenogram.

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PHYSICIAN PREPARING TO GIVE EXPERT TESTIMONY MAY PROPERLY STIPULATE FOR COMPENSATION

(Birch *vs.* Sees (N. Y.), 165 N. Y. Supp. 846)

The Supreme Court of New York, Appellate Division, Second Department, said that it must take it as established by the verdict for $500 rendered in favor of the plaintiff that he, an attending physician and a lifelong acquaintance of the deceased whose will had been offered for probate, having testified on a prior trial as an expert witness for the proponent of the will, at an agreed compensation of $50 per day, was thereafter employed by a succeeding attorney for the proponent at the same terms, to go over the witness' records to prepare himself so as to give expert testimony on the issue of the deceased's mental soundness, which he did on two trials, there having been three trials. It was, however, objected that as the plaintiff had been the attending physician his testimony was not that of an expert, and that such agreement for compensation should not be enforced. But it seems settled that if a medical witness, or other witness with technical qualifications, goes beyond mere testimony to facts, observed by the senses, and is asked to draw a technical inference or conclusion, he may properly stipulate for compensation. The facts in this case were therefore within the permissive rule, and the judgment on the verdict, for the plaintiff, should be affirmed, with costs.

PURPOSE FOR WHICH ROENTGENOGRAMS MAY BE USED

(Russell *vs.* Borden's Condensed Milk Co. of Utah (Utah), 174 Pac.R. 633)

The Supreme Court of Utah says that in this personal injury case it was contended that the trial court erred in admitting in evidence certain roentgenograms showing the condition of the plaintiff's hip and hip joint. It was insisted that the roentgenograms had a tendency to mislead the jurors, who were merely laymen and thus possessed no knowledge respecting the injuries to the bone or to the hip or hip joint. If the roentgenograms had been introduced for the purpose indicated by counsel, there would be much force to their contention. A jury of laymen possessing no knowledge or experience respecting the bones and injuries thereto might easily be misled by a mere roentgenogram, by which at the best merely the outline of the bone can be shown. The roentgenograms, however, were not introduced for the purpose indicated by counsel. They were used by the physicians in illustrating their evidence, and were fully explained, and were introduced in evidence only as affording a fuller and clearer understanding by the jury of the physicians' testimony respecting the condition of the plaintiff's injured hip and hip joint. The court committed no error in receiving the roentgenograms for the purpose for which they were received and used.

UNIDENTIFIED ROENTGENOGRAMS NOT ADMISSIBLE AS EVIDENCE

(Bartlesville Zinc Co. *vs.* Fisher (Okla.), 159 Pac.R. 476)

The Supreme Court of Oklahoma reverses a judgment obtained by Plaintiff Fisher, for personal injuries, on account of error in the admission in evidence of certain roentgenographic plates tending to prove the existence of certain physical defects in and about the bony structure of his head. The evidence afforded to identify the plates was given by a physician who testified that from an examination of the plaintiff, based on symptoms related to him, he was unable to find the cause of the plaintiff's trouble, and sent him to another physician to have a roentgenographic plate made, and that he was not present when the plates were made. The witness further testified that his evidence, relative to the plaintiff's injuries, was

based on the information divulged by these plates. The expert who made the plates did not testify, nor did any one who was present at the time the plates were made. The Court said that the plates were not admissible in evidence, nor could they be, until they were properly identified or shown to have been made by trustworthy instruments properly used by a person skilled in making, reading, and interpreting such plates, and further shown to be correct representations of the bony structure of the plaintiff's head. The admission of roentgenographic plates in evidence rests fundamentally on the theory that they are the pictorial communication of a qualified witness who uses this method of conveying to the jury a reproduction of the object of which he is testifying; this being true, the roentgenographic plates must be made a part of the testimony of some qualified witness, and the witness should qualify himself by showing that the process is known to himself to give correct representations, and that it is a true representation of such object.

RULE AS TO PRIVILEGED COMMUNICATIONS IS APPLIED TO ROENTGENOLOGIST

(Shaw *vs.* City of Nampa (Idaho), 171 Pac.R. 1132)

The Supreme Court of Idaho applies the rule as to privileged communications to a roentgenologist, in this personal injury case, under the following circumstances, as stated by the Court. When the plaintiff was injured, she employed a physician who immediately took her to another town, where he employed a physician to take a roentgen-ray picture of her broken arm. After the picture was taken and developed, the second physician or roentgenologist consulted with the first or plaintiff's regular physician relative to the interpretation of the picture and the treatment to be administered. Counsel for the plaintiff objected to the roentgenologist's testifying as to any facts learned while he was thus employed, which objection the Supreme Court holds was properly sustained. It appeared from the evidence, the Court goes on to say, that the roentgenologist did more than perform mere mechanical work as a photographer, and that he used his knowledge and experience as a physician in interpreting the meaning of the picture, and advised with the plaintiff's regular physician as to what treatment should be given, the plaintiff paying the roentgenologist for his services. The trial court was justified in excluding such evidence as privileged communication, under the Revised Codes of Idaho, Section 5958, Paragraph 4.

CASE REPORTS AND NEW DEVICES

AN APPARATUS FOR COLLECTING RADIUM EMANATION

By ALEXANDER J. ALLEN and RACHEL G. FRANKLIN
Cancer Research Laboratories, University of Pennsylvania Graduate School of Medicine, PHILADELPHIA

INTRODUCTION

Radium emanation has a definite place in the treatment of cancer. Its chief advantage over the radium element is that it can be put into small enough containers and is of such nature that, once inserted into a tumor, it need never be removed. A second advantage is that while radon can be used for every treatment for which the radium element can be used, radon implants contain no radium. If they are mislaid, carried away on a patient, or lost in any other way, the loss is negligible. However, good radium emanation plants are of necessity sufficiently complicated to make them costly to install and to maintain. By the adoption of modern scientific methods it was hoped to develop a plant of low initial and maintenance costs which would be practical for both small and large amounts of radium.

The requisites of a good emanation plant are:

1. The apparatus must be efficient; that is, as much as possible of the emanation formed must be collected in the container in which it is to be used, and it must be well purified, as it is usually desirable to use the emanation in as small a container as possible.

2. The apparatus must be reliable and as fool-proof as possible; that is, it must be sturdy and practically free from breakdown.

3. It is desirable to have it as simple as possible to maintain and operate.

4. The problem of safety to the operator must be considered.

5. Any saving in cost is always desirable.

With the above points in mind, a constant effort has been made to simplify and improve the apparatus described in the article published last year(1). The necessity of using P_2O_5 has been eliminated by the use of solid CO_2* and the plant is of such design that any water which is taken from the radium solution is again returned. Once the plant is installed it is not necessary to renew or replace any parts, except the gold and glass implant tubing.

The apparatus is made entirely of Pyrex glass, which makes it more sturdy and less liable to break down than if it were made of soft glass. Mercury diffusion pumps simplify the usual pumping procedure and produce excellent vacua with a minimum amount of labor. Magnetic valves simplify the design and operation of the apparatus. The time that an attendant must be in the vicinity of the apparatus is small, which reduces the danger of over-exposure to gamma rays.

DESCRIPTION OF PARTS

In the diagram of this plant (Fig. 1), *A* indicates a glass bulb which is enclosed in a safe and contains the radium solution. This is surrounded by a copper coil, *W*, through which water is circulated to keep the temperature of the radium solution below that of the outside room temperature.

*Through the courtesy of the Sharpless Ice Cream Company we have been furnished free of charge with all the solid carbon dioxide necessary to develop and operate our plant.

Valve V_1, a magnetic valve which closes the passage from A to B, consists simply of a small cylindrical piece of soft iron loosely sealed in a glass plunger which is ground with fine emery to make a good joint at one end. The solenoid furnishes a magnetic field for lifting the plunger when an electric switch is closed. B and E are traps used to collect vapors when they are submersed in a mixture of solid CO_2 and acetone.† Y is the tube which connects the duplicate sides of the apparatus. The apparatus is made in duplicate in case one side becomes broken or out of order. V_2 is an emergency valve to prevent any possibility of mercury getting into or beyond B. G is a mercury reservoir into which the mercury is drawn to open the passage from B to E. The mercury is always kept at a height of about 40 cm. in C except when the passage is being opened, so that, in case any part of the apparatus becomes accidentally broken, the mercury will rise to a difference in height of approximately 76 cm. and stop. This prevents any air from accidentally entering A which would cause the loss of the collected emanation. D is a regulator which automatically increases the amount of heat supplied to H when the pressure in E and H is increased.

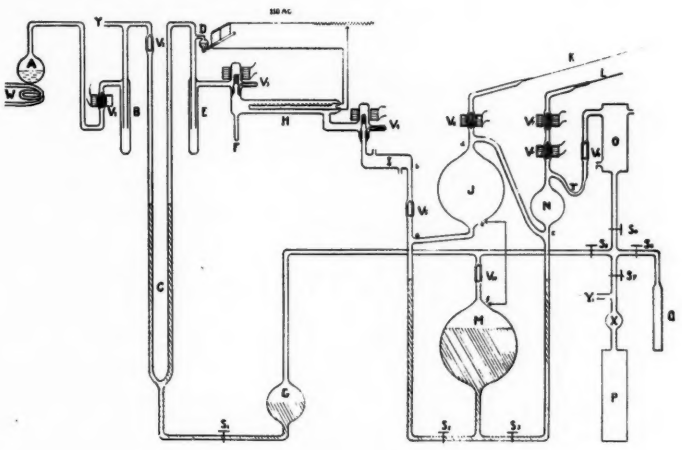

Fig. 1. Diagram of emanation plant.

V_3 is a magnetically operated, mercury-sealed valve which when closed prevents vapors from migrating from E into F or H. The opening in V_3 must be fairly large to allow a free circulation of gases and vapors from E to F and H. This valve is shown in detail in Figure 3 in which B' is a glass plunger which is ground to form a tight joint at A'. The joint is surrounded with mercury to form a mercury seal when B' is lowered into the mercury. D' is a glass plunger containing a small cylinder of soft iron. When it is desired to open the valve for a long period of time, B' is raised and the plunger D' is moved under it with a permanent magnet. The valve will withstand atmospheric pressure in the direction of the arrows E' to F'. In the opposite direction it will withstand only a low pressure.

F is a small tube containing a few crystals

†The freezing point of acetone is below that of CO_2, which permits a better thermal contact with the glass trap than does the CO_2 alone, and hence greatly increases the efficiency of the trap.

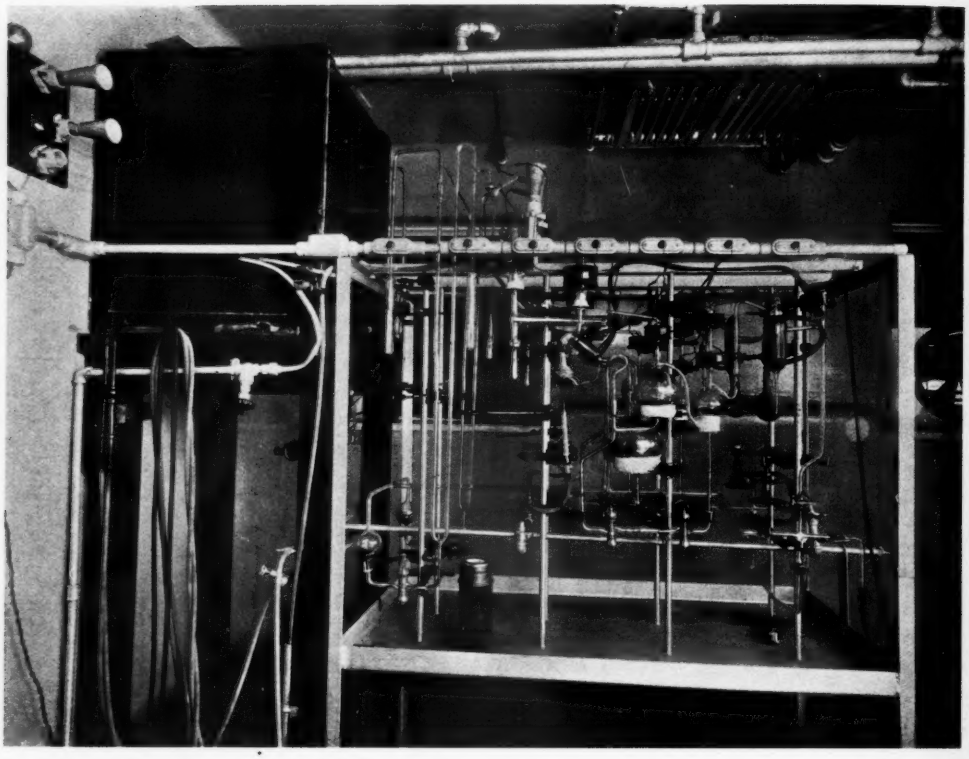

Fig. 2. Photograph of emanation plant. Such an apparatus has been placed by the Cancer Research Fund in the Oncologic Hospital in Philadelphia, where it is in regular and successful use with 200 mg. of radium.

of potassium hydroxide. This removes small traces of CO_2, which is apparently generated by the disintegration of small amounts of organic matter which could not be removed from the apparatus. This seems necessary, to obtain radon of high concentration, especially when the apparatus is first put into operation. If it were not for the presence of the CO_2, valve V_3 and tube F could be eliminated. H is a platinum wire which is placed in or around a quartz tube and heated with an electric current. This supplies heat to an oxidized copper gauze surrounding the quartz tube which causes hydrogen and oxygen to recombine to form water vapor. Hydrogen and oxygen are produced by the disintegration of water in A by the presence of the α, β, and λ radiations from the radium and its disintegration products.

V_4 is a valve similar to V_3 except that it can be much smaller. Its use is to prevent the radon from entering I until it has become well purified. I is a small mercury diffusion pump which is used to force the purified radon from D, E, F, and H into J. This pump works very satisfactorily and very quickly. V_5 is a glass check valve which automatically prevents mercury from flowing from M into I. J, N, and M are simple Toppler pumps used to force the radon into K or L. For convenience in making the diagram, reservoir M is shown lower than it is in reality. Actually, e and f are at the same level. K is the small glass capillary into which the

radon is forced when glass implants are wanted. The radon is transferred into the small gold tube, L, which is waxed on to the glass when gold implants are wanted.

V_6, V_7, and V_8 are magnetic valves similar to V_1. T is a trap which when filled with mercury prevents radon from entering O and prevents air from entering N. V_9 is similar to V_5 and V_2 and prevents mercury from flowing into O. O is an ordinary glass mercury vapor diffusion pump which aids in quickly and easily obtaining an excellent vacuum throughout the system. P is a Mega Vac oil pump which produces sufficient vacuum for the operation of O and also for the withdrawal of the mercury from C, J, and N. S_4, S_5, S_6, and S_7 are ordinary glass stop-cocks which control the inlet or exit of air to the various parts of the system. S_1, S_2, and S_3 are mercury-sealed stop-cocks (2) which control the flow of mercury in and out of C, J, and N, respectively. V_{10} is the same as V_2, acting as an emergency check valve which prevents the mercury from flowing past it in case of accident. X is a trap which prevents mercury or foreign material from entering the oil pump P. Q is a $CaCl_2$ dryer and glass wool air filter.

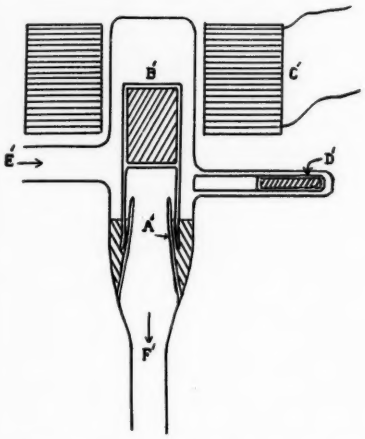

Fig. 3. Detailed diagram of special magnetic valve.

A photograph of this plant is shown as Figure 2.

PROCESS OF WITHDRAWING RADON

Assuming the apparatus to be completely evacuated and the mercury and valves in positions as indicated in Figure 1, the procedure for withdrawing, purifying, and collecting the radon into the gold or glass tubes is as follows: immerse trap E into a Dewar flask containing solid carbon dioxide and acetone. Valve V_4 remaining closed, open valve V_3. Lower the mercury in C for about 20 seconds or longer, depending on the total amount of gases collected in A, by applying a vacuum to G, thus opening a passage from A to E. The fact that E is nearly —40° C. will cause a rush of water vapor from A which condenses in E and carries with it most of the radon, hydrogen, oxygen, carbon dioxide, helium, etc.‡ The water vapor is thus trapped in E, and the hydrogen and oxygen pass on to the hot copper screen in H and are reduced to water vapor. The CO_2 is taken up in F. After standing three or four minutes C is again opened for a few seconds and practically all the remaining radon is drawn into the purification chambers. The apparatus is then allowed to stand about 25 minutes, during which time the radon becomes well purified. Before V_4 is opened, it is necessary to close the trap T and the passage from J to N. This is done by admitting air pressure to M and opening cock S_3, thus allowing the mercury to rise in N.

V_4 is then opened and the mercury diffusion pump I quickly (approximately one minute) forces the purified radon from the purification chambers into J. S_2 is then opened, which allows the mercury to rise in

‡At —40° C. the vapor pressures of the enclosed vapors are: water, 0.096 mm.; radon, 200 cm.; hydrogen, very high; oxygen, very high; CO_2, 76 cm., approximately. Since the vapor pressure of water is very low, it condenses and remains in the trap while the other gases or vapors present are free to migrate about the purification chambers.

J, forcing the radon ahead of it past V_6 into K. The mercury is then lowered in J but the radon remains behind, trapped beyond valve V_6 in K. V_6 automatically forms a mercury-sealed stopper as the mercury level is lowered into J. In practice, less than 1 or 2 per cent of the radon remains behind after the first stroke of this Toppler pump. If on the second stroke 1 per cent of the remainder is left, there is little use for the third stroke.§

If no gold implants are wanted, the radon is compressed to the desired volume into the end of K and sealed off with a tiny gas flame, being later separated into implants of the desired size. The volume is regulated in the following manner: if stop-cocks S_5 and S_6 are opened, there will be a pressure of 1 atmosphere on the surface of the mercury in M and, since the difference in height between the surface and K or L is approximately 38 cm., the radon will be compressed to approximately ½ atmosphere. This is a desirable pressure for sealing glass radon implants. However, the radon can be further compressed by closing stop-cocks S_2 and S_3 and applying a pressure on the mercury surface in valve V_9 by opening cock S_4. After taking off the radon the vacuum should immediately be re-established above V_9 before opening S_2 or S_3.

In case it is desired to put all the radon into gold implants, cocks S_2 and S_3 are opened and the mercury lowered in J to about e and in N to below c. Valve V_6 is opened and practically all the radon diffuses into J and N. V_6 is closed and the mercury is caused to rise in J, forcing the radon into N. The mercury is then caused to rise in N. Valve V_8 has acted automatically to prevent the mercury from entering the gold tube L. Its action is stopped by applying a magnetic field which holds it down against the buoyant force of the mercury. V_7 then acts as did V_6, and N, S_3, and M becomes a Toppler pump, which after one or two strokes transfers practically all the radon from K into L. The radon is again compressed to the desired volume, sealed off with a special pair of pliers, and later cut into implants of the desired length. If all the radon was not forced into L, it can be returned to K by reversing the process.

In case, for instance, it is desired to put only one-third of the radon into gold seeds (the volume of N is equal to one-fourth that of J), open stop-cock S_2 and allow the mercury to lower until J is one-half emptied. Close S_2. Lower mercury in N below c and open V_6. Shortly the radon will come to equilibrium and one-third will be in N and two-thirds in J. Allow the mercury to rise in N, then in J, forcing the one-third into L and the two-thirds into K. By adjusting the mercury level in J, the radon can be divided roughly into any amounts between L and K. To open T for re-evacuation purposes, lower the mercury in N below c, leaving J filled. Open stop-cocks S_6 and then S_4, allowing air pressure to force the mercury from T into N.

At this stage there will be a certain amount of condensed water vapor in E and it is desired to transport this back into A. Close valve V_1, which prevents water from passing from A to B. Move the Dewar flask containing the solid CO_2 and acetone from E to B, having first closed valve V_3 to prevent the KOH in F from absorbing the freed water vapor. Enough heat will soon be supplied from the room to melt the ice in E. C is then opened and the water soon migrates to B. Again close C, remove the Dewar flask, and allow the ice to melt and the water to become warm. Open V_1 and the water will slowly migrate back to A, it being the cooler place. The migration is accelerated if the heat from an electric heater is allowed to fall on B. No harm is

§The volume of the tubing between I and J (ab) is very small compared to the volume of J, hence the amount of radon left in ab after the second stroke is negligible, providing, of course, that the pump, J, had in the beginning drawn all the radon from the purification chambers.

done if the water is allowed to remain in *E* for several pumpings.

With as small an amount of radium as 200 mg. in the plant, it is quite easy to supply gold implants 4 mm. long, 0.15 mm. internal diameter, containing 4 mc. of radon.

SUMMARY

The outstanding qualities of this apparatus are:

1. Once installed, no parts or chemicals need be renewed or replaced, except the implant tubing.

2. Heavy Pyrex glass is used throughout, which makes the apparatus stronger and less apt to become broken.

3. Radon can be easily, efficiently, and quickly purified and forced into gold or glass tubes with little danger of over-exposure of the attendant to gamma rays.

REFERENCES

(1) ALLEN, ALEXANDER, J.: A New Model Radium Emanation Plant. Jour. Cancer Research, August, 1930, XIV, 461-465.
(2) FAILLA, G.: U. S. Patent No. 1,609,614.

DESCENDING INTRAVENOUS PYELOGRAPHY

By CARLOS HEUSER, M.D., BUENOS AIRES, ARGENTINA

Translation by JOSEPH MALDONADO, M.D., NEW ORLEANS, LA.

It has been observed that, in pregnant women, intravenous pyelography is more successful than in non-pregnant women and this has proved true in cases in which the two iodine compounds, uroselectan and abrodil, have been used. The success of this method of visualization in pregnant women has been explained by the fact that the fetus makes pressure either on the iliopsoas muscle or on the ureters as they cross the brim of the pelvis, or just before they enter the bladder.

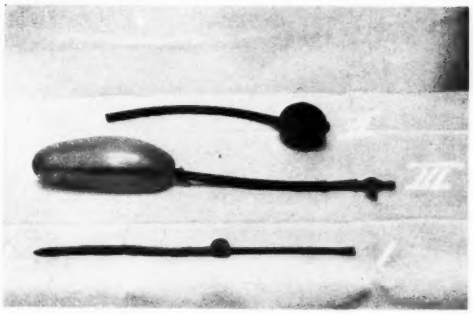

Fig. 1. I, The collapsed balloon; II, Air bulb; III, Distended balloon.

This observation incited us to try to imitate fetal pressure. To produce the necessary effect we have to apply pressure either on the bladder or the ureters, as the fetus applies its pressure. In the German literature on this subject, we read that pressure is applied over the abdomen to compress the ureters. This, obviously, is difficult and at times impossible of accomplishment, especially in obese individuals.

When we realized the faults of the abdominal pressure method, we began to work out a method of imitating fetal pressure in the most physiologic manner possible. This, we thought, could be accomplished by filling the large intestine and also the bladder with air, thus producing the desired pressure on the ureters as they enter the bladder. In this manner we could bring out:

(1) The outline of the bladder;

(2) The kidney outline, which stands out better because the pressure on the ureters keeps the urine from flowing too rapidly into the bladder, allowing the radiologist to study the flow of opaque substances from the kidney.

The procedure, which we term "artificial pregnancy," is as follows: The bladder is filled with 100 c.c. of air. Now if the large intestine is also distended, all the air goes to the transverse portion, causing blurring of the shadows sought, *i.e.*, kidneys and ureters, so that air in the intestine is a dis-

advantage rather than an aid. To meet this obstacle the author devised a rubber balloon attached to a tube with a key, which controls the air passage at the end. A rubber bulb is used to inject the air. With a forceps, the collapsed balloon (I) is inserted into the rectum. When one feels that the balloon is on the level with the base of the bladder, the air is injected gradually, using the bulb (II). When the balloon is dilated, the key is closed, stopping the flow of air. The balloon then remains distended (III), pressing against the bladder base.

While the method described above is quite effective, still we have found it advantageous to use at the same time abdominal pressure by means of a binder which prevents the balloon from passing up the rectum past the base of the bladder, where the pressure is desired. The pressure at the base of the bladder should be continuous for from four to five minutes before the X-ray plates are made.

Fig. 1. Air shadow between eleventh and twelfth ribs.

SUBHEPATIC PNEUMOPERITONEUM DEMONSTRATED IN GALL-BLADDER FILMS

By ARTHUR BETTS, M.D.,
SPOKANE, WASHINGTON

Pneumoperitoneum is a well-established sign of perforation of the gastro-intestinal tract. The following case is reported because of the characteristic gas shadow obtained in the films of the gall-bladder region.

B. H., male, was admitted to St. Luke's Hospital on May 29, 1931, and immediately referred to the X-ray Department for cholecystography. On the preliminary roentgenograms (Fig. 1) of the gall-bladder region, there was a dark shadow lying beneath the liver and above the kidney.

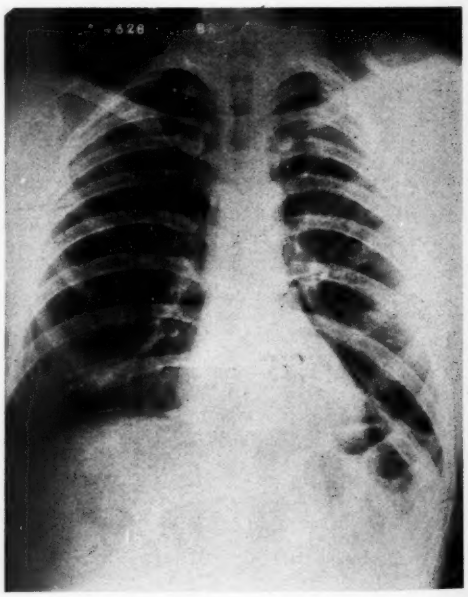

Fig. 2. Free air under diaphragm with patient erect.

This shadow, which was somewhat oval in shape, did not conform to the haustral markings of the colon, which could be seen below it. The finding seemed indicative of free air in the abdomen. For verification, a chest film (Fig. 2) was made with the patient erect, and a small amount of air was seen under each diaphragm.

At operation, a perforated duodenal ulcer was found.

First X-ray Examination of Lungs of Students.—For the first time in the educational history of this country, a policy of subjecting the lungs of all members of the entering classes in all departments of a university to X-ray examination has been adopted. This measure was put into practice by Yale University as a further means of safeguarding the health of its students, an annual report of the Department of University Health states.

The X-ray films are made with a view to determining the presence of tuberculosis in any of its manifestations. All students whose chest films show indications of trouble are to be carefully followed during their college courses and examination of their chests will be made at least once a year.

"A certain number of them should thus be saved from a breakdown, and a single one so saved would justify the expense," the report stated.

Stereoscopic X-ray films were made last year of 1,602 new students. A total of 283 students, or 17.7 per cent of those examined, gave evidence of an amount of infection potentially dangerous but, in most cases, not destined to cause trouble.—*Science Service.*

EDITORIAL

LEON J. MENVILLE, M.D. . . . . *Editor*
BUNDY ALLEN, M.D. . . . *Associate Editor*

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THE SELECTION OF THERAPY APPARATUS[1]

The development of modern roentgenotherapy has brought into common use a great deal of expensive and delicate apparatus. It is not surprising that the young roentgenologist, trained in a great university which is equipped regardless of expense so that a large number of patients can be treated rapidly and efficiently, may assume that a similar expenditure is essential on his part. He may wonder how the income from the few patients he can expect to have will justify what seems to be a large, but necessary, investment. In this time of economic adjustment it is prudent to try to separate necessities from luxuries.

The minimum requirements for modern roentgenotherapy apparatus are that it will permit any required dose of rays to be delivered to any part of the body safely and accurately.

Capacity. — Increasing the capacity of transformers and tubes enables us to produce X-rays of increased intensity and hardness. Great intensity, from the use of 200 K.V. transformers and deep therapy or water-cooled tubes, has one, and only one, distinct advantage. While very hard X-rays save time and allow us to treat many patients rapidly, they have not yet been shown to possess any peculiar therapeutic virtue. They do have greater penetrative power, permitting a closer approach to homogeneous distribution. This has the practical advantage of proportionately decreasing the amount of radiation absorbed by the healthy tissues surrounding a deep lesion, and, theoretically at least, lessening the danger of severe constitutional reactions. Transformers and tubes capable of operation at from 130 to 140 K.V. meet the minimum requirement, that is, they will deliver any required dose to any part of the body. If the economical limit of a 40 cm. anode-skin-distance and 0.25 mm. copper filters are used with 140 K.V., the depth-dose-percentage at 10 cm. is 30 as compared to 39.3 with a 50 cm. anode-skin-distance and 0.5 mm. copper with 200 kilovolts. The time for each area is about one and one-half times as long, and more areas are necessary. If the anode-skin-distance is increased to 70 cm. and the filter thickness to 0.5 mm. copper, the depth-dose-percentage is 38.6, the distribution comparing well enough with that obtained by a high voltage technic. We may conclude, therefore, that a well-trained roentgenologist who is willing to spend his time need not hesitate to accept patients for treatment because the capacity of his transformer and tube is only 140 kilovolts.

Safety.—Danger to the patient from electrical shock, and from stray radiation as well, can be entirely eliminated by completely surrounding the tube with lead and by guarding with grounded metal all wires that can possibly be touched by the patient. This means that tube-stands of the open-bowl type should be abandoned and replaced by the cylinder, the couch, or the slanting wall. These need not be ornate; more attention

[1]Read before the Radiological Society of North America at the Seventeenth Annual Meeting, at St. Louis, Nov. 30–Dec. 4, 1931.

should be paid to their durability and ease of operation than their beauty.

Accuracy.—The energy put into the X-ray tube must be measured by a milliammeter and a kilovoltmeter which has been calibrated under working conditions with a sphere gap. The daily use of a sphere gap is not necessary, as a kilovoltmeter can be depended upon to furnish a constant index of voltage, although it may not indicate the actual voltage.

The output of radiation from the tube cannot be determined by formulæ. It can be roughly estimated from the effect of experimental exposures on the untanned skin. A far more reliable procedure is to have the output measured at regular intervals by an instrument calibrated in absolute units. The time is fast approaching, if it is not here now, when the ownership and regular use of a measuring instrument will be considered essential to accurate roentgenotherapy.

Finally, the amount of apparatus to be purchased and its capacity depends upon the number of patients to be treated. The articles enumerated in the foregoing paragraph are the bare essentials. As patients become more numerous, other pieces of equipment may be added, such as transformers and tubes of greater capacity, water-cooled tubes, sphere gaps, stabilizers and electroscopes, water phantoms, and spectrographs for experimental study and research.

ARTHUR W. ERSKINE, M.D.
Cedar Rapids, Iowa.

COMMUNICATIONS

PROGRAM OF THE AMERICAN RADIUM SOCIETY

NEW ORLEANS, MAY 9–10, 1932

May 9—10:00 A. M.

Symposium on Cancer of the Skin

Chairman: W. S. NEWCOMET, M.D., Philadelphia, Pa.

1. LAURENCE R. TAUSSIG, M.D., San Francisco, Calif.
   "The Treatment of Epithelioma of the Skin: Indications for Radium Therapy."
2. MAX CUTLER, M.D., Chicago, Ill. (By invitation.)
   "Radiation Treatment of Cancer of the Skin."
3. C. H. MARTIN, M.D., Dallas, Texas
   "The Advantages of Radiation in the Treatment of Skin Carcinoma."
4. G. MILLER MACKEE, M.D., New York, (By invitation.)
   "Methods of Treatment of Cancer of the Skin."

Discussion to be opened by LESTER HOLLANDER, M.D., Pittsburgh, Pa.

Discussants: WILLIAM H. CAMERON, M.D., New York, N. Y.; LEROY SANTE, M.D., St. Louis, Mo.

5. RUSSELL S. FERGUSON, M.D., New York, N. Y.
   "The Effect of External Radiation on the Hormone of the Anterior Hypophysis in the Treatment of Teratoma Testis."

2:00 P. M.

6. D. G. MORTON, M.D., San Francisco, Calif. (By invitation.)
   "Cancer of the Cervix Uteri."
7. HENRY SCHMITZ, M.D., Chicago, Ill.
   "The Results Obtained with the Scattered Fraction Method of Irradiation of Carcinoma of the Uterine Cervix."

Symposium on Radiation Therapy for Uterine Hemorrhage of Non-malignant Origin

Chairman: E. H. SKINNER, M.D., Kansas City, Mo.

8. A. U. DESJARDINS, M.D., Rochester, Minn.
   "Radiotherapy for Benign Hemorrhage of the Uterus."

9. J. A. CORSCADEN, M.D., New York, N. Y.
"Treatment of Uterine Fibroids."
10. O. L. NORSWORTHY, M.D., San Antonio, Texas
"Benign Uterine Neoplasms, with Special Reference to Treatment."

Discussion of papers Nos. 6-10 to be opened by C. JEFF MILLER, M.D., New Orleans, La. (by invitation), and W. P. HEALY, M.D., New York, N.Y.

May 10—9:30 A. M.

Symposium on Cervical Nodes Metastatic from Intra-oral Cancer

Chairman: D. M. LENZ, M.D., New York, N. Y.

11. VILRAY P. BLAIR, M.D., St. Louis, Mo. (By invitation.)
"Care of the Lymphatic Drainage Areas of the Neck."
12. CALVIN B. STEWART, M.D., Atlanta, Ga. (By invitation.)
"Neck Care in Intra-oral Malignancies."
13. ELLIS FISCHEL, M.D., St. Louis, Mo. (By invitation.)
"Treatment of Cervical Nodes Metastatic from Intra-oral Cancer."
14. JAMES J. DUFFY, M.D., New York, N. Y.
"Management of Cervical Nodes Metastatic from Intra-oral Cancer."

Discussion to be opened by EDWIN C. ERNST, M.D., St. Louis, Mo.

Discussants: URBAN MAES, M.D., New Orleans, La. (by invitation), and G. W. GRIER, M.D., Pittsburgh, Pa.

15. HENRY K. PANCOAST, M.D., E. P. PENDERGRASS, M.D., and GABRIEL TUCKER, M.D. (by invitation), Philadelphia, Pa.
"The Treatment of Appropriate Cases of Cancer of the Bronchus and Esophagus by Supplemental Radon Implantation."

Discussion to be opened by HENRY J. ULLMANN, M.D., Santa Barbara, Calif.

2:00 P. M.

16. EDITH H. QUIMBY, M.A., New York, N. Y. (By invitation.)
"Dosage from Long Radium or Radon Needles."

Discussion to be opened by J. L. WEATHERWAX, Ph.D., Philadelphia, Pa. (By invitation.)

Symposium on Cancer of the Lip

Chairman: FRANK E. SIMPSON, M.D., Chicago, Ill.

17. C. C. LUND, M.D., Boston, Mass. (By invitation.)
"Analysis of the Treatment of Cancer of the Lip at the Huutingdon Hospital from 1918 to 1926."
18. B. F. SCHREINER, M.D., and W. L. MATTICK, M.D., Buffalo, N. Y. (By invitation.)
"Five-year End-results in the Treatment of Cancer of the Lip. (New York State Institute for the Study of Malignant Diseases.)"
19. O. H. WANGENSTEEN, M.D., Minneapolis, Minn.
"Report of Cases of Cancer of the Lip at Cancer Institute, University of Minnesota Medical School."
20. JEROME WEBSTER, M.D., New York, N. Y.
"The Operative Treatment of Epithelioma of the Lip."

Discussion to be opened by ALTON OCHSNER, M.D., New Orleans, La. (By invitation.)

Discussant: ROLLIN H. STEVENS, M.D., Detroit, Mich.

THE AMERICAN COLLEGE OF RADIOLOGY

The annual convocation and dinner will be held at the St. Charles Hotel, New Orleans. The business meeting of the Chancellors will take place at 7:00 P. M. Tuesday, May 10th.

All the Fellows will convene at 6:30 P. M., Wednesday, May 11. The first order of business on that evening will be the presentation of the candidates to the President, A. C. Christie, M.D., who will conduct the convocational exercises and confer the degrees, after which comes the dinner, followed by the President's address, reports from the Board of Chancellors, and the regular business session for the Fellows.

The officers are:

OFFICERS

Arthur C. Christie, M.D., *President,* Washington.
Albert Soiland, M.D., *President-elect,* Los Angeles.
William A. Evans, M.D., *Vice-president,* Detroit
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Isador S. Trostler, M.D., *Historian,* Chicago
Benjamin H. Orndoff, M.D., *Executive Secretary,* Chicago.

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Harvey W. Van Allen, M.D., Springfield, Mass.
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George E. Pfahler, M.D., Philadelphia, Pa.
Thomas A. Groover, M.D., Washington, D. C.
Douglas Quick, M.D., New York, N. Y.
Edward W. Rowe, M.D., Lincoln, Neb.
Rollin H. Stevens, M.D., Detroit

AMERICAN MEDICAL ASSOCIATION SECTION ON RADIOLOGY

May 9-13, 1932

Chairman: HENRY K. PANCOAST, M.D., Philadelphia, Pa.

Vice-chairman: LEON J. MENVILLE, M.D., New Orleans, La.

Secretary: GEORGE W. GRIER, M.D., Pittsburgh, Pa.

Executive Committee: FRED M. HODGES, M.D., Richmond, Va.
ARTHUR W. ERSKINE, M.D., Cedar Rapids, Ia.
HENRY K. PANCOAST, M.D., Philadelphia, Pa.

The program of the Section on Radiology will be published in the *Journal of the American Medical Association,* to which our readers are referred.

BOOK REVIEWS

A RADIOLOGICAL STUDY OF THE PARA-NASAL SINUSES AND MASTOIDS. By AMÉDÉE GRANGER, K.C.B., K.C.I., M.D., F.A.C.R., Professor of Radiology, Louisiana State University Medical Center; Director of the Department of Radiology, Louisiana State Charity Hospital, New Orleans; Gold Medal of the Radiological Society of North America in 1926; Gold Academic Palms of France in 1929. Contains 186 pages and 113 engravings. Published by Lea & Febiger, Philadelphia, 1932. Price, $5.50.

This work, as stated by the author, is a compilation of a number of articles which have appeared from time to time in the current literature. The section devoted to the paranasal sinuses deals largely with the posterior ethmoids and sphenoids, as it is Granger's belief that the other sinuses can usually be examined satisfactorily by the rhinologist. His observation that a small amount of pus in the maxillary sinus usually collects along the nasal wall is particularly interesting to the reviewer,

as is also the statement that a fluid level can seldom be observed, confirming my own belief.

Likewise, his experience with iodized oil would seem to be that of many other radiologists, namely, that this method serves only to demonstrate more vividly lesions which may be observed on properly made films without the use of oil.

In the examination of the sphenoids, Granger has evolved a position which throws the roof of these sinuses in clear relief, and, even if not accepted as a substitute for all other positions, is undoubtedly a valuable addition to the study of these cavities. The author stresses at considerable length the necessity of following his technic rigidly if his own results are to be duplicated. Briefly, his technic is as follows:

1. The patient must lie prone with the head tilted beyond the horizontal. The object of this position is to cause any pus in the sphenoids to run forward against the anterior wall, as it is this portion of the sinuses which is demonstrated by his position.

2. An angle block tilted 17 degrees beyond the horizontal must be used to support the patient's face.

3. This angle block must have a false top with a hole in it through which the nose projects, the film cassette being beneath.

4. With the patient in position, the face must rest firmly against the forehead and alveolar process in the upper incisor region.

5. The central ray is projected directly downward through the tragus of the ear.

6. If all factors are correct, the shadow of the petrous portion of the temporal bone will fall entirely within the orbit, and the roof of the sphenoids will be represented by a convex line at the base of the frontal sinuses.

If pus is present in the sphenoids, the lower border of this line will be obliterated because the pus will be lying right up against it. The area below the line will be opaque for the same reason. Polypi produce a similar appearance, although the shadow is usually more dense. Hyperplastic sinusitis produces a rarefaction of the sinus walls, and the line is less distinct and broadened, with the lower border difficult to recognize.

The author believes that the greatest use of the lateral view is to measure the distance between the anterior nasal spine and the anterior wall of the sphenoid, so that the surgeon may know definitely when he is in the sphenoid sinus. For this reason, he always makes his lateral views at a distance of six feet so as to minimize the magnification of this measurement. The numerous beautiful illustrations of specimen skulls with the sinuses filled with opaque material and the great variety of cases demonstrating actual pathology serve to convince one of the value of the author's methods.

In the section on mastoids, Granger describes his modification of Arcelin's position, first reported by him in 1926. This position gives an approximate anteroposterior view of the mastoid and is especially valuable to demonstrate the tip cells. In the reviewer's opinion, this view is an indispensable part of the X-ray examination of the mastoid. Granger's method of making this view is superior to the original Arcelin position in that the patient lies on his back instead of on his face, certainly an easier position for the patient. The head rests on an angle block of 17 degrees, inclined toward the feet. The head is rotated laterally away from the side to be examined, the inclination being 40 degrees beyond the vertical. The central ray is focused directly downward through the mastoid, giving an approximate anteroposterior view.

Granger uses a special head rest with a support for the side of the face which makes it easy to measure the desired angle. In this view the cells in the tip and those directly above are brought into relief in a way which is impossible in any other view. By this view, not only opacity of the cells, but destruction of cell partitions and even erosion of the cortex (Bezold mastoid) can be recognized.

In some cases of furunculosis of the auditory canal, with swelling of the external ear, the mastoid area may appear opaque in the usual Law position, but in Granger's position it will be seen that the pathology is not actually in the mastoid cells. The same observation applies to periostitis of the mastoid tip. Tumors of the acoustic nerve are also well demonstrated by this position.

Granger makes the observation that in infants under about three years of age, the mastoid cells are so undeveloped that the anterior wall of the lateral sinus cannot be seen, since there is no pneumatization in front of it to act as a contrasting medium. In these infants if the mastoid becomes infected and the bone destroyed over this area, the anterior wall of the sinus becomes distinctly visible. In many cases this new sign of mastoid disease has been the means of diagnosing mastoid abscess when it was not possible to do so by other means.

Granger believes that treatment with very mild doses of X-rays in infantile mastoiditis before the stage of pus formation may result in resolution of the process.

There are also many beautiful illustrations in this section of the book which includes demonstrations of the technic of his positions as well as many examples of mastoiditis in all stages, cholesteatomas, acoustic tumors, and infantile mastoiditis, recognized by the unusually clear visualization of the anterior sinus wall.

Altogether this little book is a very valuable addition to the literature of roentgenology of the sinuses and mastoids.

G. W. GRIER, M.D.

STUDIES IN THE PHOTO-ACTIVITY AND THERAPY OF THE TUNGSTEN-TITANIUM ARC. By J. BURDON-COOPER, M.D., B.S., B.Sc. (Duch.), F.R.C.S.E, D.O. (Oxon.), F.C.S., and A. ROBERTS, T.D., F.R.C.S.E., M.R.C.S. Eng. (Bath). Pages 85, with 21 plates. Published by William Wood & Co., New York, 1931. Price $3.50.

This monograph has been written in order to supply information gained by the authors during the last three years with a therapeutic lamp using a composite electrode of tungsten and titanium. In the first part the emission of the tungsten-titanium arc is analyzed, mostly by the spectral method; a large number of spectrograms is appended. The results can be summarized as follows: The spectrum of the arc contains about 50 per cent short erythema-producing rays, 25 per cent long non-erythema-producing rays, and 25 per cent visible rays in the photo-active part of the light spectrum. This compares very favorably with the pure tungsten arc, which, according to the authors, has, for instance, only 42 per cent of short erythema-producing rays. The times for producing identical skin reactions are 1.8:1 in favor of the tungsten-titanium arc.

In the second and clinical part of the book the clinical model of this arc, known as the Crombie lamp, is described with its accessories. Detailed instructions are then given as to the proper use of the equipment. The general effects following the exposure are also outlined; they are illustrated by excerpts from a patient's letter describing his experience after the use of this lamp. As appears from the next chapter, beneficial results will be obtained in eczema, acne, alopecia, general debility, circulatory disturbances, asthma, anemia, and rheumatic conditions. Numerous histories taken from the files of Dr. Roberts are quoted. In conclusion, the authors state that this monograph is offered as the "groundwork of a sincere conviction that the tungsten-titanium arc not only has potential energy and characteristics that are in some respects unique, but also possesses a clinical value in general actinotherapy which we cannot well afford to ignore."

E. A. P.

MUNICIPAL INSTITUTE OF RADIOLOGY AND ELECTROLOGY, BUENOS AIRES

By CARLOS HEUSER, M.D.,
BUENOS AIRES, ARGENTINA
Translation by JOSEPH MALDONADO, M.D.,
New Orleans, La.

Last year a new Institute was opened, its object being to give patients sent by attending physicians of the various municipal hospitals in the city the necessary radiologic treatment. It is a central laboratory as well as a therapy center. Any patient who needs either radiologic or electric treatment and who is in good enough condition to be moved from his hospital is brought here. The necessary tests are made on the patient and a report is sent to the physician in charge.

The Institute, which is under the direction of Dr. Umberto Caselli, is subdivided into departments for X-ray, both diagnosis and treatment, electrotherapy, radium therapy, and kinesitherapy.

Besides, the Institute has access to 80 beds where patients can be placed while they are being treated. There is a chemical laboratory, rooms for roentgenography, and rooms for electrocardiography and X-ray diagnosis of the respiratory, digestive, and genito-urinary tracts, fractures and dental lesions. There is a department for X-ray therapy (both deep and superficial) as well as divisions for radium therapy, diathermy, electrotherapy, and electrodiagnosis. The department for local and general ultra-violet radiation is under the direction of Dr. Fernández. Each of these departments has its own attending chief, assistants and nurses, and equipment of apparatus.

Municipal Institute of Radiology and Electrology, Buenos Aires.

We have been informed that this Institute is the most complete and best equipped in the world.

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Henry Bayon, M.D.
Samuel Brown, M.D.
Charles S. Capp, M.D.
L. J. Carter, M.D.
F. Cavers, D.Sc.
M. M. Copeland, M.D.
B. J. DeLaureal, M.D.
C. H. DeWitt, M.D.
C. G. Dyke, M.D.
Otto Glasser, Ph.D.
N. G. Gonzalez, M.D.
F. L. Grandstaff, M.D.
J. E. Habbe, M.D.
H. W. Hefke, M.D.
H. A. Jarre, M.D.
P. J. Kerley, M.D.
E. T. Leddy, M.D.
Joseph Maldonado, M.D.
L. Marinelli
Ernst A. May, M.D.
H. C. Ochsner, M.D.
Ernst A. Pohle, M.D., Ph.D.
Francis B. Sheldon, M.D.
C. G. Sutherland, M.D.
W. T. Warwick, M.A.
W. W. Watkins, M.D.
W. W. Whitelock, Ph.D.
E. C. Vogt, M.D.

APPARATUS

Gastric Endophotography. M. G. Spehl. Arch. d. mal. de l'app. digestif, October, 1931, XXI, 968, 969.

The author gives a technical description of the apparatus, which consists essentially of a photographic tube and a condenser-transformer. It is best to use a current of 220 volts and 6 ampères. The instrument can be easily inserted if it is introduced obliquely.

Before taking plates it is important to obtain sufficient inflation, so that the instrument is from about 5 to 6 cm. away from the gastric wall.

The greatest source of error lies in the fact that folds of mucosa resemble lesions at times. Some of the findings have been the recognition of hypertrophied and atrophied mucosa, various types of small and large ulcers, including plaques of small bullæ in a case of pulmonary tuberculosis, suggestive of gastric tuberculosis. The absence of large folds on the smaller curvature was also noticed.

Colored photography has been tried, but it is very difficult to perform.

B. J. DeLaureal, M.D.

Photo-electric Tube. Archie J. McMaster and Charles E. Parson (to G. M. Laboratories, Inc.) U. S. Patent 1,831,314, Nov. 10, 1931.

A light-sensitive surface is provided on a cathode of a photo-electric tube by depositing an alkali metal, such as Cs, on the cathode and subsequently admitting O to the tube to oxidize the metal, and expelling the excess of the metal.

Chemical Abstracts.

THE APPENDIX

Reflex Phenomena in Chronic Appendicitis. George Coote Field. British Jour. Radiol., October, 1931, IV, 504-506.

The writer considers the three following signs or symptoms to constitute an important triad in the diagnosis of "chronic appendicular lesion": Onset of gastric discomfort within from three to four hours after eating; no gastric or duodenal lesion radiologically demonstrable, and reflex pyloric spasm seen roentgenoscopically, with associated increase in gastric peristalsis following pressure in the right iliac fossa. These roentgenologic findings were more often seen associated with non-visualization of the appendix, the appendix at operation often being found to be retrocecal in position. With the appendix lying free of the cecum and with no associated cecal inflammation, the reflex could not be elicited.

J. E. Habbe, M.D.

THE BLADDER

Tumors of the Urinary Bladder. Henry A. Brady. Med. Bull. Veterans' Administration, December, 1931, VII, 1165-1169.

The author attempts to explain the development of bladder tumors as an exaggeration of a physiologic process. Continual irritation and the promotion of hyperemia serve to give unnatural impetus to the inherent power of cells to proliferate and create new tissue in the process of repair. In the end, "super cells" are thus created which are so powerful that these crowd out and break through and invade other tissues. In this manner physiologic phenomena are converted into a pathologic process.

In the bladder we have the ideal field for the inception and development of tumors. Long-continued irritation from unrecognized infection, together with the excessive acidity or alkalinity which accompanies it, furnishes the necessary stimulus until the tumor has reached the proportions of a malignancy.

Papilloma is the most frequent newgrowth found in the bladder, and carcinoma, which is thought to be an evolution of the papilloma, is the next tumor of importance in order of frequency. The adenoma is usually an invasion from the prostate gland. Histologically these tumors are composed of a fine framework of connective tissue in which there is a network of small blood vessels, covered at first with epithelium and later with the tissues which they have invaded. These tumors are usually pedunculated.

The symptomatology of bladder tumors varies with the size, location, character, and tissue involvement. Hematuria has long been considered the cardinal symptom of vesical tumors. Cystoscopic examination is considered of great value in the diagnosis as well as in the determination of the size, location, and character of the tumor and the type of therapy to be instituted.

The author is of the opinion that early fulguration through the cystoscope offers the most favorable results. The patient should be carefully examined every three months for at least two years after the tumor has completely disappeared. Radiation should be combined with fulguration in the treatment of tumors which have attained considerable size, even though they fail to show any malignant change. Radium is found valuable in many cases, especially when used to control hemorrhage. From 50 to 100 milligrams may be applied for a period of from

six to eighteen hours. After the bleeding is controlled, fulguration may be done and X-radiation given. In the author's opinion, cystotomy should be avoided, if possible, and resorted to only as a life-saving measure.

The author reports several cases of tumors of the urinary bladder and discusses the methods of treatment employed in these cases. Favorable results were obtained in this series following the instillation of a 2 per cent solution of urea and quinine hydrochloride. The author believes that this chemical is not greatly different from fulguration and radiation in its action upon the tissues, for these agents all sclerose the blood vessels and are anesthetic in their action.

J. N. Ané, M.D.

BONE (DIAGNOSIS)

Lines of Arrested Growth in the Long Bones in Childhood: the Correlation of Histologic and Radiographic Appearances in Clinical and Experimental Conditions. H. A. Harris. British Jour. Radiol., November, 1931, IV, 561-588.

The author studied intensively the development, appearance, and disappearance of the transverse lines of increased density seen not infrequently in the ends of long bones a little distance proximal to the epiphyses. These lines are similar to the lines of epiphyseal union in that both groups obey certain laws of nature. First, the density of the line is proportionate to the severity of the illness; second, the arrest of growth is manifested at the more rapidly growing ends of the long bones, that is, at the knee, ankle, and wrist. The extent to and rate at which these lines tend to disappear bear some relation to the stresses and strains in the neighborhood of the joint and to the degree of functional usage of the part following the illness which produced the line. Hence, the lines are more apt to persist in monaxial joints, such as the ankle and knee, but the more active the individual following the development of the lines of arrested growth, the more remodelling of bone and absorption of the lines is apt to occur. Finally, with increasing age of all individuals, whether they are leading active or sedentary lives, there is greater probability of eventual disappearance of the lines as a part of the process of absorption and deposition which is continually going on in living bone.

As a result of this study the writer believes that there may be a practical medico-legal application for identification of individuals, also that studies of the long bones, such as the knee or ankle regions, might prove of value to insurance companies. Absence of lines of arrested growth would indicate either absence of severe illness during the growth period or active life thereafter, with subsequent removal of all evidence from the bones of the periods of disturbance in growth.

J. E. Habbe, M.D.

Halisteresis of the Epiphyses on the Basis of Endocrine Disturbances. Friedrich Tebrügge. Röntgenpraxis, Nov. 1, 1931, III, 988-990.

It is known that rickets, osteomalacia, and osteitis fibrosa are not local diseases of the bones, but are caused by severe disturbances in the calcium metabolism. Many authors believe that an hyperparathyreosis is responsible for osteitis fibrosa generalisata (Recklinghausen).

In an 18-year-old boy who complained of rheumatic pains, especially in the shoulders, roentgenograms revealed relatively wide epiphyseal lines and quite marked osteoporosis of the epiphyses themselves, especially in the shoulders and hips. Chemical tests showed a pathologic amount of calcium excretion and a high calcium level in the blood (from 25 to 30 mg. per cent). The clinical and roentgenologic picture points to a hyperfunction of the parathyroids.

H. W. Hefke, M.D.

Total Luxation of the Talus. P. Pfaehler. Schweiz. med. Wchnschr., Aug. 8, 1931, LXI, 768, 769.

Complete luxation of the talus without fracture is an unusual occurrence. Krönlein found no dislocations in 400 cases of luxation, the author having observed no cases previously. Böhler had never seen a dislocation similar to the one the author describes and illustrates (a medial and anterior dislocation).

A 33-year-old man fell from a height of 3.5 meters, striking the inner surface of his foot, in plantar flexion, against a circular object. The force was the opposite to that usually described as being responsible for this type of injury.

H. C. Ochsner, M.D.

The Use of Roentgen Rays in Fractures (Technic and Organization). Lorenz Böhler. München. med. Wchnschr., Sept. 18, 1931, LXXVIII, 1609-1613.

The diagnosis of a fracture can usually be made by an experienced physician without the aid of the X-ray, but X-rays are absolutely essential for treatment and in the event of industrial compensation cases. It is especially unwise if the physician advises against roentgen examination when the pa-

tient suggests one. A fluoroscopic examination alone often leads the inexperienced to wrong diagnosis, by failure to see a very thin fracture line; as, for instance, in a fracture of the navicular bone of the hand, which sometimes on the radiograph can be seen only by means of a magnifying glass. Films must be taken in two views, frontal and lateral. The central ray must pass through the fracture and the film must be large enough to include the next joint. It is also essential to place the necessary markers on the cassette for identification. A fracture should be radiographed before and after adjustment, and in difficult cases every one or two weeks thereafter; also, after removal of the cast and before the patient is to be discharged.

E. A. May, M.D.

Avulsion Fracture of the Tibial Tuberosity. O. Winterstein. Schweiz. med. Wchnschr., Aug. 8, 1931, LXI, 761-763.

The possibility of confusing Osgood-Schlatter's disease with fracture of the tibial tuberosity has been suggested by Schlatter. The author reports an avulsion fracture somewhat similar to Schlatter's seventh case. A 17-year-old boy, who had previously complained of pain in the knee, met with an injury which caused a detachment of the tuberosity of the right tibia.

H. C. Ochsner, M.D.

Isolated Fracture of the Pisiform. W. Jaeger. Schweiz. med. Wchnschr., Aug. 8, 1931, LXI, 766, 767.

Before the advent of the roentgen rays, only one case of fracture of the pisiform bone was reported —that of Guibot, in 1848. Since that time eleven case reports have appeared in the literature. To these the author adds another, with illustrations of the roentgen findings. The occurrence of the rare pisiform secundarium must be excluded by roentgenographs of the opposite hand. Treatment should be conservative, but if pain continues for longer than three months the bone should be removed.

H. C. Ochsner, M.D.

A Case of Isolated Fracture of the Lesser Trochanter. Yngve Kewenter. Acta Orthopaedica Scandinavica, 1931, II, 160-165.

Isolated rupture of the lesser trochanter is to be classed among the fractures of rare occurrence.

The author reports a case of this nature in a boy, 12 years of age, who suffered the injury during gymnastic exercises. During the double quick march, with long steps, the order to halt was given, when suddenly the hip became "locked." The roentgenogram showed a fracture of the lesser trochanter, with the minor fragment dislocated upwards and medially. The patient's hip was bandaged with plaster of Paris, with the injured leg somewhat flexed, slightly adducted, and rotated outwards.

At the end of two weeks, the patient was discharged, with a slight limp, but otherwise free from symptoms. Three months later, roentgen examination revealed good callus formation between the trochanter and the epiphysis of the femur.

This fracture nearly always occurs between the ages of 12 and 16, and almost exclusively in boys. Diagnosis is not easy to establish, but may be facilitated by the anamnesis and by the presence of Ludloff's symptom, *i.e.*, inability to raise the leg in a sitting position. This symptom, however, may be negative if the fracture is incomplete. But roentgen examination confirms the diagnosis and generally reveals the displaced trochanter, luxated medially and proximally. Prognosis in the case of young patients seems to be invariably favorable.

W. W. Whitelock, Ph.D.

BONE DISEASES (DIAGNOSIS)

A Rare Picture of a Symmetrical Disease Seen in the Skeletons of the Extremities. H. U. Billich. Röntgenpraxis, Nov. 1, 1931, III, 984-988.

A case is described, which presented bilateral symmetrical areas of density in the upper thirds of both tibias. The distal thirds of both bones of the leg showed less extensive areas of density. The same changes were noted in the distal thirds of the bones of the forearm. All of these bones showed osteitic, specifically osteosclerotic, densities in symmetrical form, more marked near the joints. These findings remained stationary for 18 months. The Wassermann reaction was negative.

The author considers this condition to be indicative of a bone lesion, with features both of melorheostosis (Léri) and osteitis condensans (Sicard).

H. W. Hefke, M.D.

Tuberculous Infection of the Diaphysis of the Long Bones. B. K. Popoff. Vestnic Röntgenologii i Radiologii, IX, Nos. 2 and 3, p. 173.

The author reports a case of a child, of the age of one year and seven months, who presented multiple lesions involving the shafts of the long bones. He received a series of ultra-violet and heliotherapy exposures with very good results, although his general condition was very poor at the start.

The author presents a full discussion of tuberculosis of the diaphysis, which he states is very rare as a primary affection and is very difficult to diag-

nose. It is especially difficult to differentiate it from syphilis, osteomyelitis, and tumors of the long bones. The following clinical and roentgenologic points are presented in assisting one in making an accurate diagnosis:

(1) The bone lesions are multiple; (2) the bones of the forearms are most often affected; (3) the sclerotic changes are mild; (4) sequestra are frequently present; (5) the lesion is usually confined to the middle of the shaft; (6) the soft tissues are swollen; (7) the temperature is elevated; (8) suppuration is abundant; (9) youthfulness of the patient, and (10) negative Wassermann reaction.

A series of roentgenograms accompanies the paper, illustrating the gradual improvement of the bone lesions under the treatment.

SAMUEL BROWN, M.D.

Acute Suppurative Conditions of the Hip Joint. Guy A. Caldwell. Jour. Am. Med. Assn., Jan. 2, 1932, XCVIII, 37-40.

The author includes all infectious processes that produce pus within the capsule of the hip joint, previously described acute infectious arthritis, acute suppurative arthritis, acute epiphysitis, acute pyogenic arthritis, and septic joints. Penetrating wounds of the hip, with infection and gonorrheal arthritis, have purposely been omitted, because they are rarely seen in children.

A summary of the records of seventeen patients with eighteen acutely involved hip joints is presented to show pus found in these joints resultant from a hematogenous infection of the synovial lining; femoral neck (intra-articular portion); capital epiphysis of the femur, and pelvic bones forming the acetabulum.

The anatomy and pathology are reviewed with a brief summary of the symptoms and diagnosis. Treatment involves early emptying of the joint and prevention of reaccumulation of pus.

A review of the end-results indicates that ankylosis or pathologic dislocation is the usual sequel when the primary site of infection is in the intra-articular bony structures, whereas an excellent functional result is the rule when the process begins in the synovial membrane.

Roentgenograms should be made after drainage to determine whether or not there is bone involvement; if bone destruction is apparent, drainage must be provided by some other route than through the hip joint.

C. G. SUTHERLAND, M.D.

CANCER (DIAGNOSIS)

The Dilatation of the Duodenum in the Case of a Carcinoma of the Upper Portions of the Jejunum. A. M. Rybak. Röntgenpraxis, Oct. 15, 1931, III, 932-934.

Malignant tumors of the jejunum are very rare. A case is described in which a marked dilatation of the entire duodenum, with retention in the duodenum for twenty-four hours, was found on roentgenologic examination. It is impossible, in the author's opinion, to differentiate roentgenologically a malignant tumor leading to obstruction from an obstruction produced by other causes (adhesions, tuberculous glands, etc.). The clinical history (marked loss of weight) and other clinical findings (tumor, blood in the feces) must help to determine the etiology.

H. W. HEFKE, M.D.

CANCER (THERAPY)

Pre- and Post-operative Treatment of Cancer of the Breast by Radiation (Metastasis Excluded). J. E. A. Lynham. British Jour. Radiol., November, 1931, IV, 534-560.

Search of the literature by the author reveals the fact that from 75 to 95 per cent of all cases of cancer of the breast are in the stage of skin involvement, adhesions to the muscles, glandular invasion, or wide-spread metastases when first submitted to medical care. Many of these cases are obviously beyond any hope of actual benefit by surgery.

The complex processes involved, whereby irradiation can effect such changes in the tissues as to inhibit malignant growth, bring about its disappearance, or prevent its occurrence, have been widely studied experimentally, but they are not yet well understood. Certain facts of interest from experiments dealing with tumor implantation in animals have been obtained, however, which may have some practical application to the problems of pre- and post-operative irradiation of breast cancers. It has been shown that by giving a certain dose of X-rays to a localized area in animals, the number of tumor implantation "takes" in such irradiated areas is much smaller than the number of "takes" in non-irradiated areas in the same animals. Also, doses of irradiation given to tumor tissue *in vitro* before implantation, which have no inhibiting effect on subsequent growth *in vivo*, will, if given to the tissues after tumor implantation, often cause a disappearance of the tumor. Such experimental results suggest some tumor immunizing effect on the cells of the host by the radiation. In this connection it has been observed that too heavy a dose will fail to inhibit the subsequent tumor growth. There is considerable conformity of opinion derived from experimental work to the effect that cells in a latent state show complete cumulation of several radiations, while cells in an active state show incomplete cumulation. Hence, in practical

radiation therapy two objectives should be sought: extinction of actively dividing cells and ultimate inhibition of activity of latent ones.

With the above facts in mind, the author believes that pre-operative radiation should be relatively intense, should be delivered in a short period of time, and should include the entire breast and the related lymphatic areas, but should not be of such a character as to damage tissues or interfere with healing of the operative wounds. (From ten to thirty days should elapse between cessation of radiation and operation.)

Post-operative radiation may ordinarily be commenced three weeks post-operative, the first series of treatments following the principles of pre-operative irradiation, with, however, the intensity of dosage being gradually reduced and the time interval lengthened. This would be given with the thought of destruction of actively dividing cells (which must always be presumed to exist), while the latent tumor cells could be most effectively controlled by divided doses extending over a prolonged period, irradiation being administered widely over various areas of the body.

J. E. Habbe, M.D.

The Influence of Radio-active Energy upon the Carbohydrate Exchange in Cancerous Disease. A. P. Kostigova. Vestnic Röntgenologii i Radiologii, IX, Nos. 2 and 3, p. 122.

Fifty-one female patients, thirty-three of whom had cancer of the sexual organs, were subjected to radium or roentgen-ray treatment, or both. Before radiation was instituted, the sugar content in the blood was determined and was found to be below normal in most of the cases. After the radiation treatment, the sugar content in the blood was again determined and was found to have declined in those patients who showed improvement in their condition, while in those who showed no improvement the sugar content in the blood was found to be raised.

Samuel Brown, M.D.

A Study of Cancer in Ex-service Men. Philip B. Matz. Med. Bull. Veterans' Administration, December, 1931, VII, 1128-1149.

The author found in his study of 319 cases of cancer, occurring in ex-service men, that syphilis was associated in only 2.1 per cent, arthritis in 6.9 per cent, and diabetes in 1.9 per cent. It is of interest also that of the 319 cases of malignancy there were 41 patients with co-existing active pulmonary tuberculosis and one with tuberculosis of the dorsal vertebræ.

Among 89 ex-service men who died from cancer, the minimum known duration of the disease was two months, the maximum known duration was 156 months, and the mean known duration was 25.6 months. Of a group of 203 living ex-service men affected with malignancy, the mean known duration was 45.5 months. The activity of patients with cancer is dependent to a considerable extent upon the site as well as upon the stage of the disease. While, as a general rule, constitutional symptoms of cancer develop in the later stages, it is of common occurrence that in tumors of the digestive tract and of the lymphatic system the activity of the patient is greatly limited in the incipient stages.

A study of the results of treatment correlated with the various regimens used showed that the most effective therapeutic procedures in the order named were: Radium; surgery and irradiation; X-ray; surgery; X-ray and radium. Of 315 patients with cancer undergoing hospitalization, 42.8 per cent were considered improved upon the termination of the hospitalization; 20 per cent were unimproved; 5.1 per cent were worse; and 32.1 per cent died during the period of hospitalization. At death the mean age of patients with carcinoma was 47.6 years, and with sarcoma, 42.5 years.

J. N. Ané, M.D.

Alkaline Reserve in Cases of Uterine Carcinoma after Radiotherapy. G. de Candia. L'Actinoter., June, 1930, IX, 75-94. (Reprinted from "Cancer Review" by permission.)

From blood examinations made on women with uterine carcinoma, the author finds that, following treatment by radium or X-rays, there is diminution of alkali content. This diminution is progressive from the first to the fifth or sixth day; then it passes off and after about fourteen days the alkali content returns to normal. Apparently, the strength of the dose given bears no relation to the degree of this acidosis.

F. Cavers, D.Sc.

Clinical Data Concerning the Pre-operative and Post-operative Irradiation of Cancer of the Breast. Paul de Backer. Strahlentherapie, Nov. 14, 1931, XLII, 744-752.

During the period from 1919 to 1929, the author observed 109 cases of carcinoma of the breast, which received pre- and post-operative irradiation. In the beginning treatment was given for from fifteen to twenty days before operation and post-operatively as soon as the wound had closed. One or two fields were applied over the tumor area and one or two fields over the anterior and posterior axillæ and the supraclavicular region. Eight cases treated accord-

ing to that technic were followed up. One patient died after the operation, due to hemorrhage; two remained well for ten and seven years, respectively; one died seven and one-half years after the operation.

Since 1924, pre-operative irradiation has been given up. Since 1921, radium screens have been used in the axillary region, inserted through drains. In the supraclavicular area 2×6.6 mg. screens are applied; in the infraclavicular area 3×6.6 mg. screens are used, the screens being placed along the blood vessels. Perpendicular to those in the infraclavicular region, 3×6.6 mg. screens are placed in the posterior angle of the wound, for from 50 to 60 hours. This corresponds to from 20 to 24 millicurie doses. After the wound has closed, deep therapy is given: spark gap from 35 to 38 cm., 0.5 mm. Zn + 1.0 mm. Al, 30 cm. F.S.D., 11×16 sq. cm. field. At least five ports of entry are used, sometimes as many as seven or eight. Each field receives from 3,000 to 4,000 Solomon R units distributed over from 6 to 7 days. Fifty-one cases treated according to this method show the following results: During 1921, five patients were treated, two of whom are still alive; during 1922, ten were treated, none surviving; during 1923, seven were treated, none surviving; during 1924, 26 were treated and seven survived; early in 1925, three were treated and one survived. This means that 7 out of 26, or 27 per cent, are alive seven years following operation and irradiation.

During the period from 1919 to 1924, 13 cases were treated after operation by X-rays only. Four of these are still alive and are in perfect health. One patient died nine years after treatment at the age of 71, and another patient, six years after treatment, from advanced carcinoma of the other breast. Another patient died three years after the operation. In this series, therefore, 30 per cent of the cases were still alive seven years following operation and irradiation.

Since 1925, radium has been applied immediately after operation. A mold of Columbia paste 1.5 cm. thick holds from six to eight screens, 10 mg. each, filtered through gold equivalent to 2.0 mm. Pt, and so arranged as to permit homogeneous irradiation. The treatment takes from seventeen to twenty days over an area of from 300 to 400 square centimeters. The total dose amounts to from 250 to 300 millicurie doses, or approximately 40,000 milligram-hours. The exact time of application depends on the condition of the wound. Treatment is given sometimes from 10 to 14 days after operation and sometimes from four to six weeks later. Great care is taken that all radium screens are so arranged that they cover the lymphatics in the infraclavicular region and the area drained by the mammaria interna. The scar itself, its immediate surroundings as well as the axilla are treated later, usually from two to three months after operation, by X-ray deep therapy. During the first year from eight to ten treatments are given, during the second year five or six, and during the third three or four. In each single sitting about 50 per cent H.E.D. are applied. During 1925 and 1926, seven cases were treated this way, and three are still alive. During 1927, nine cases were treated, and three are still living. Five of the six patients treated during 1928 are still alive. During 1929, of fifteen who were treated, ten are alive. Two patients of the latter group have developed metastases.

The author concludes his analysis as follows: During 1925, 51 cases were treated by implantation of radium tubes; after six years, ten, or 20 per cent, are still well. One must consider, however, that many advanced cases were in this group because too many inoperable cases were subjected to operation. Of 21 cases which had received X-rays only, either before or after operation, six, or 28.5 per cent, are still alive eight years after operation. Three of those patients who died had remained well for six years.

Of 20 cases which were treated by radium more than three years previously, in addition to moderate roentgenotherapy, ten, or 50 per cent, are still alive. (In comparing the percentages of results, one must not forget that the last group is based on three years' observation, while the first and second groups are based on six and eight years', respectively.) It is concluded that although the therapeutic results obtained by roentgen and radium therapy alone are not sufficiently good to warrant one in giving up operation, post-operative irradiation is undoubtedly valuable.

ERNST A. POHLE, M.D., Ph.D.

The Treatment of Cancer of the Lip by Electrocoagulation and Irradiation. George E. Pfahler and Jacob H. Vastine. Jour. Am. Med. Assn., Jan. 2, 1932, XCVIII, 32-36.

The great majority of patients give a history of smoking excessively, many having an associated dry, scaly, or atrophic condition otherwise on the lip. As an additional source of irritation, many of these patients have been exposed much to the sun and wind, being farmers and sea-faring men. These atrophic areas are now destroyed at the beginning, healthy granulation and a well-nourished scar following.

During the last five years biopsies have been done in all cases. When there is any doubt, the lesion is treated as malignant until the microscopic report comes. The general methods of treatment and technic are given in detail.

There has been a recovery of 95.5 per cent in all primary cases, even when there were palpable lymph glands, but only 71 per cent of recoveries in the recurrent cases. Of all types of cases that were treated

more than five years ago, 85.5 per cent have been cured. This includes the recurrent and metastatic cases.

C. G. SUTHERLAND, M.D.

CHEST (DIAGNOSIS)

The Subsequent Course of Forty Patients with Acute "Dry" Pleurisy. Marshall N. Fulton and Richard G. Hahn. Jour. Am. Med. Assn., Dec. 26, 1931, XCVII, 1959-1961.

Pleurisy, with effusion, occurring as a primary illness without demonstrable cause is looked on as tuberculous. That a dry pleurisy is a frequent precursor of pulmonary tuberculosis is well appreciated. The study was undertaken to secure additional information regarding the subsequent course of patients with acute dry pleurisy. Figures in the literature indicate that from 30 to 40 per cent of patients with dry pleurisy eventually manifest pulmonary tuberculosis.

The authors found that tuberculosis had developed in only four of forty patients with acute dry pleurisy in whom no primary cause could be shown and who have been followed from one to sixteen years—on an average of seven years.

While this group is not large, it points strongly to a favorable prognosis in acute dry pleurisy of unknown cause.

C. G. SUTHERLAND, M.D.

The Radiographic Demonstration of the Vena Azygos. W. J. Mowat. British Jour. Radiol., December, 1931, IV, 690-692.

During a study of the esophagus, with the patient in the right postero-anterior oblique position, the writer accidentally observed a small oval shadow about one-half inch in its longest diameter and of the same density as the aortic shadow. It lay in contact with the right postero-lateral aspect of the esophagus at the level of the fourth or fifth thoracic vertebra. After some study it was decided that this shadow was not due to any pathologic process, but represented the horizontal portion of the vena azygos (the most important collateral channel between the superior and inferior vena cavæ), seen on end. This vessel may produce sufficient pressure upon the esophagus to lead to the erroneous diagnosis of spasm of the esophagus, impacted foreign body, or peri-esophageal abscess. Of course, in the presence of thoracic neoplasm, causing pressure on the superior or inferior vena cava, one might hope to demonstrate a dilatation of the vena azygos; hence this anatomic landmark may at times, if abnormal in appearance, yield contributory evidence of pathology elsewhere.

J. E. HABBE, M.D.

Silent Pneumonia in Infants. G. Mouriquand and J. Savoye. Jour. Méd. de Lyon, Nov. 5, 1931, XII, 631-637.

This is a discussion of the silent type of pneumonia in infants, including the history, etiology, and clinical and diagnostic study as well as prognosis and evolution. Of the radiologic findings the following is said: "Radioscopy shows a triangular image if the involvement is at the apex, or the right middle lobe. Most frequently, if the base is involved, it cannot be geometrically traced. The diagnosis cannot be completely made without radiological views. The radiological triangle remains the capital symptom. This silent form demonstrates the importance of the X-ray in the examination of infants with pneumonia. . . . Incontestably, radiology alone permits of absolute precision in the study of pneumonia in the infant."

B. J. DELAUREAL, M.D.

Unusual Development of the Lower Lobes of the Lung Following Selective Artificial Pneumothorax. G. Rossel. Schweiz. med. Wchnschr., Aug. 22, 1931, LXI, 793-795.

A case of tuberculosis of the right upper lobe was treated by selective pneumothorax, producing collapse of the upper lobe. This procedure is based upon the tendency of normal lung tissue to expand and of the areas of infiltration to collapse. In this case a series of roentgenographs demonstrated a gradual expansion of the lower lobes until they occupied almost all of the right side of the chest; the upper lobe remained collapsed.

H. C. OCHSNER, M.D.

CHEST (GENERAL)

Radiology of the Chest. An Introduction to the Study of Radiograms of the Chest. E. W. Twining. British Jour. Radiol., December, 1931, IV, 658-679.

This article represents a reprint from the *Manchester University Medical School Gazette* in which journal it was originally published for undergraduate reading. It might well be recommended for reading by any practitioner who doubts the necessity for "special views," for, after describing the more important anatomic landmarks, the author describes some of the special positions necessary in the differentiation of pathologic conditions, particular attention being given to interlobar pleural pathology.

The second part of the article consists of a brief discussion on interpretation of pathologic changes in the lungs and pleuræ. Particular warning is sounded against over-emphasis of generalized promi-

nence of linear markings of varying degree, which so often are without pathologic significance. A number of sketches are used to illustrate the article, and these serve to make the paper easy to understand by one not yet versed in roentgen pathology of the chest.

J. E. HABBE, M.D.

Localization of Pleural Adhesions. J. V. Sparks and Franklin G. Wood. British Jour. Radiol., November, 1931, IV, 592-598.

Cases of pulmonary tuberculosis undergoing artificial pneumothorax treatment not infrequently require accurate localization of pleural adhesions which are interfering with the collapse therapy. This can be done in some cases with satisfactory accuracy by routine stereoscopic postero-anterior views (taken by the writers oftentimes, with the patient lying prone and with the tube in a fixed position, while the table is shifted the usual 10 cm. distance between exposures of the first and second films). Many times, however, this procedure is not sufficient for certain localizations of the site of attachment of the adhesion on the parietal pleura. In such cases the authors use fluoroscopy to determine the optimum angle for visualization of the adhesion in the right and left oblique positions and then make films in these positions. The nearer the adhesion to the apex the more difficult it is to localize because of the relative shallowness of the thoracic cavity in this region.

J. E. HABBE, M.D.

CHEST (THERAPY)

Pneumolysis in Pneumothorax with Adhesions; Report of Five Cases. S. T. Taylor. Med. Bull. Veterans' Administration, December, 1931, VII, 1160, 1161.

As a general rule, pneumothorax is successful in direct proportion to the degree of collapse of the diseased area that is obtained. However, in some cases of partial pneumothorax the splinting effect of the thin layer of air and the resulting reduction of mobility act as favorable influences in promoting healing. Practically all unsatisfactory pneumothorax inductions are due to unyielding adhesions which prevent adequate collapse of diseased structures. Extensive surgical procedures would be necessary to convert these chests into satisfactory pneumothorax cases.

The author has adopted the method of cutting these adhesions by means of a thoracoscope and an electric cautery. In his opinion, this procedure is applicable to those cases in which sufficient space exists between the surfaces of the two pleuræ, and the adhesions are suitably thinned out.

Five cases with reproductions of roentgenograms are reported. All of these patients had been receiving pneumothorax therapy for six months or more before the pneumolysis operation. The cavities were unclosed and the diseased areas were not immobile. Clinically, the progress of these patients was considered unfavorable. Eight months subsequent to the cutting of the adhesions by means of the thoracoscope and the electric cautery, all the cases in the author's series showed marked improvement, as determined from clinical and roentgenologic examinations.

J. N. ANÉ, M.D.

Roentgenographic Appearance of Thorax after Rib Resection for Pulmonary Abscess. John T. Farrell, Jr. Jour. Am. Med. Assn., Dec. 26, 1931, XCVII, 1939-1943.

This study is based on the post-operative roentgen observations of twenty-three patients. In thirteen, the abscess followed operation; twelve, tonsillectomy, and one hemorrhoidectomy. In nine, it followed an acute respiratory infection; in six, non-specific respiratory infection, and in one, it developed as a sequel to fracture of the mandible. Information is furnished as to the number and portion of ribs resected, the character of the pleural changes, and the post-operative course of the disease. Two types of alteration are seen roentgenographically after rib resection: structural and positional. Pleural abnormalities are due either to edematous swelling or to the formation of fluid. The pulmonary changes depend on the site and size of the abscess, on the condition of the pleura, and on the time elapsing after operation.

Abscess associated with pleural disease requires a longer time for complete disappearance of the roentgenographic shadows than uncomplicated abscess. The positional change of the diaphragm after rib resection is directly proportional to the extent of the accompanying pleural changes.

C. G. SUTHERLAND, M.D.

DENTAL RADIOGRAPHY

Roentgenography of the Teeth and Alveolar Processes of the Upper Jaw. S. J. Wasbourg. Vestnic Röntgenol. i Radiol., 1931, IX, 318.

The author presents an improved technic for the examination of the teeth and alveolar processes of the upper jaw. This technic consists in placing the film between the upper and lower jaws in a horizontal position, the patient holding it there with his teeth, the mouth of the patient being closed. The

central ray is directed toward the first molar at an angle of 45 degrees.

The advantages of this method are as follows: (1) The film can be held even in the absence of teeth; (2) the avoidance of introducing the finger into the mouth; (3) the possibility of holding a film in the mouth which cannot be opened widely, and, (4) the use of larger films enables one to obtain a larger area of the alveolar process and a larger number of teeth at one sitting.

SAMUEL BROWN, M.D.

DIAPHRAGMATIC HERNIA

The Diagnosis and Treatment of Diaphragmatic Hernia. Stuart W. Harrington. Jour. Thoracic Surg., October, 1931, I, 24-40.

The author points out the difficulty in diagnosing diaphragmatic hernia, which often simulates the symptoms associated with cholecystitis, gastric ulcer, cardiospasm, intestinal obstruction, and angina pectoris. The symptoms depend on the following: (1) Mechanical interference with the function of the herniated abdominal viscera; (2) interference with the function of the diaphragm; (3) amount of increased pressure within the thorax. The embryology of the diaphragm is discussed because its rôle in occasionally failing to completely fuse allows herniation.

Diaphragmatic hernia has been classified as follows: (1) Congenital; (2) acquired, and (3) traumatic. The author suggests the following classification: (1) Congenital, and (2) acquired after birth. The most common sites are through the hiatus pleuroperitonalis, through the dome of the diaphragm, through the esophageal opening, through the foramen Morgagni, and through the gap left by absence of the left half of the diaphragm.

Leading symptoms may at first be mild epigastric distress with belching. The pain may gradually become more severe, dyspnea with nausea and vomiting supervening with relief. Recurrent attacks are frequent.

Roentgenologic examination of the stomach is important in establishing a definite diagnosis. The clinical and operative observations are based on 45 cases of diaphragmatic hernia on which the author has operated in the past five years. Operative replacement of the herniated viscera into the abdomen and repair of the abdominal opening in the diaphragm is the only treatment which insures complete relief of symptoms. Palliative phrenicotomy has been used in selected cases in which operation was contra-indicated. Phrenicotomy as a preliminary procedure is often of value in repair of the hernial openings. Radical operation was performed in 38 cases. There were five operative deaths and no recurrences.

M. M. COPELAND, M.D.

Hernia or Eventration of the Diaphragm: Report of a Case. Carl Eggers. Jour. Thoracic Surg., October, 1931, I, 41-49.

A case is presented to illustrate the difficulties of correct diagnosis. The patient was a female infant, four weeks old. At birth the child seemed normal, but with each feeding (breast) she became cyanotic and dyspneic. Examination revealed lack of movement of the left chest. The heart was displaced to the right, breath sounds being absent over the left lower chest.

A fluoroscopic examination was made and X-ray films were made. They showed the heart in the right thorax, the esophagus angulated at the cardia, and the stomach in the left thorax. Other X-ray plates made later showed that a portion of the colon was situated in the hernia.

W. H. Stewart felt that the case was one of eventration, basing his diagnosis on the presence of what he thought to be a high diaphragm, which was seen in the X-ray plates. Surgical consultation expressed itself in favor of hernia, for the reason that only hernia produces such severe symptoms and causes retention of bismuth for more than six hours. Operation was decided upon. At exploration the mass was thought to be a diaphragmatic hernia. All of its contents were reduced save for the liver; however, the patient died after fourteen hours.

A whitish structure, which was pulled into view during operation and thought to be the esophagus, was found to be a stretched-out central tendon of the diaphragm when a postmortem abdominal examination was done. The diagnosis of eventration of the diaphragm was then established.

A short discussion follows the report of the case. Eventration of the diaphragm is considered comparatively rare. The congenital form is said to be due to failure of development of the muscle elements of the phrenic nerve. The acquired type is occasionally seen as a complication of an acute infectious disease (toxic action on the nerve). The treatment of a similar case would be surgical repair.

M. M. COPELAND, M.D.

DIATHERMY

General Hyperthermia with Heat Localization by Radiothermy. William Bierman and Myron Schwarzschild. Proc. Soc. Exp. Biol. and Med., January, 1932, XXIX, 439-441.

When heat is applied locally to any region of the body, it is rapidly dispersed, rendering it difficult to secure any substantial elevation of temperature in that region. In the live, anesthetized dog placed in the field of a high frequency current, the different organs heat up at approximately the same rate, the blood serving as a very efficient distributing mechanism of the generated heat. The authors

demonstrated that when the systemic temperature is elevated by radiothermy, an increased local temperature may be produced and maintained simultaneously in the vagina by applying additional electrical energy in that area. They have employed this mechanism therapeutically in the treatment of pelvic inflammation.

For the systemic elevation of temperature the subject is placed between the plates of a large condenser which forms part of an oscillating circuit. The condenser plates are 50 × 80 cm. in dimensions, and are separated from one another by a distance of approximately one meter. The patient rests upon a stretcher between these plates but not in contact with them and is kept covered during the treatment to prevent excessive loss of heat. The frequency commonly used is approximately ten million cycles per second, corresponding to a wave length of 30 meters. With a total D. C. plate current of 0.5 amperes using radio tubes of appropriate construction, it is possible to produce an elevation of body temperature of about 4 degrees Centigrade in the course of one hour and one-half. With the patient in place between the condenser plates an electrode is placed in the vagina. This electrode is connected, through an ammeter, to a small auxiliary metal plate suspended near one of the large condenser plates of the radiotherm. The electric field produced in the region between the electrode and the condenser plate, opposite the one near which the auxiliary plate is suspended, is considerably higher than it is at any other part of the body. The pick-up plate is usually placed near the condenser plate opposite the affected side. With a pick-up plate of 300 sq. cm. area, the distance between the pick-up plate and the condenser plate varies from 10 to 30 centimeters. The readings on the radio-frequency ammeter usually vary from one to two amperes.

In a series of fifty cases, it was demonstrated that in the average case the temperature in the vagina was elevated to 42.5°C. during a period of fifty-three minutes. At the same time the average rectal temperature rose to 40.5°C., while the average temperature in the mouth rose to 39°C. All temperature readings were made while the current flow was discontinued.

J. N. Ané, M.D.

EXPERIMENTAL STUDIES

Post-operative Atelectasis and Collateral Respiration. C. M. Van Allen and T. S. Jung. Jour. Thoracic Surg., October, 1931, I, 3-14.

The pulmonary function of collateral respiration is described as it is seen in dogs. The interlobular septa are incomplete and the alveoli at point of fusion communicate with each other by small openings. The pathogenesis of post-operative atelectasis, as it is now understood, is explained and experiments are offered to show why collateral respiration and factors reducing its efficiency must be included in the pathogenesis. It was pointed out that the diaphragm is little used by patients who have abdominal operations. This in turn creates deficient aeration in the lung bases, leading to retention of inflammatory secretions and to lobular, bronchial obstruction.

Following animal experimentation, the authors found that, despite marked bronchial obstruction, collateral respiration was surprisingly efficient. A very small section of lung lobe alone proved sufficient to aerate the entire lobe. Blocking by secretions or pneumonic processes in the smaller divisions of the lobe, however, will cause atelectasis, due to blocking of collateral respiration. This is readily applicable to the human lung in cases following abdominal operation.

M. M. Copeland, M.D.

Experimental Investigation of the Effect of Roentgen Rays upon the Vegetative Nerve. Part III.—Effect upon the Vascular Nerve (the Irrigating Examination on the Auricle of the Rabbit). S. Suzuki. Japanese Jour. Obst. and Gynec., October, 1931, XIV, 405-409.

Following his study of the effects of irradiation on the vegetative nerves, the author studied the effects of X-rays upon the peripheral nerves. One auricle of each of twenty-six rabbits was irradiated and the blood circulatory conditions in the irradiated and control auricles were studied at intervals of one day, two weeks, and four weeks after irradiation. Congestion and dilatation of the capillaries were noted in the irradiated auricles at intervals of from one day to two weeks after irradiation. It was also observed that four weeks after irradiation congestion was still present in the irradiated auricles, although in some cases the irradiated auricles appeared anemic at this time.

The extirpated auricles were studied after the application of adrenalin, pilocarpine, barium, and caffein. An acceleration of the reaction of the blood vessels to drugs producing vascular dilatation and contraction was observed in the irradiated auricles. It is believed that the early results were due to the changes produced in the vegetative nerves of the blood vessels by irradiation. Later on, as a result of irradiation, changes occurred also in the smooth muscles of the blood vessels.

J. N. Ané, M.D.

Experimental Investigation of the Effect of Roentgen Rays upon the Vegetative Nerve. Part IV.—Histologic Investigation of the Effect of the Irradiation of the Inferior Mesenteric Ganglion on

the Female Genitals. S. Suzuki. Japanese Jour. Obst. and Gynec., October, 1931, XIV, 410-415.

The author studied the histologic changes produced in the inferior mesenteric ganglion as a result of roentgen irradiation and also observed the secondary changes which occurred in the female genital organs. Female mature rabbits were employed as experimental animals and at intervals of from one to thirty days after irradiation the inferior mesenteric ganglion and the genital organs were extirpated, the specimens being stained with hematoxylin and eosin.

Thirty days following irradiation, examination of the stained specimen revealed atrophy of the cells of the ganglion. The cells of the ganglion were irregular and the nuclei were darkly stained and atrophied, showing no evidence of the nucleoli. Some of the cells contained small or large vacuoles, with a disappearance of the granules. The changes noted in the blood vessels and lymphatics were very slight. When the ganglion was examined from nine to twenty-one days after irradiation, the changes observed were considered very slight when compared to those observed after thirty days.

The author observed in those cases examined from four weeks to fifty days after irradiation that there occurred an acceleration in development in the female genital organs, these changes being noted to be somewhat marked in the ovaries in particular. The author is of the opinion that irradiation of the inferior mesenteric ganglion produces atrophy and degeneration of the cells of the ganglion, resulting in loss of control of the sympathetic nerves which act as vasomotor nerves in the blood vessels of the peripheral organs. This is in agreement with the previous work of the author, in which it was demonstrated that any disturbance in the ganglion produces a hyperfunction in the peripheral organs supplied by the ganglionic nerves.

J. N. Ané, M.D.

Experimental Investigation of the Effect of Roentgen Rays upon the Vegetative Nerve. Part V.—Clinical Observation. S. Suzuki. Japanese Jour. Obst. and Gynec., October, 1931, XIV, 416-420.

In previous experimental work the author demonstrated that the X-ray produces a hypertonia of the parasympathetic nervous system, as shown by the blood-pressure curves of rabbits following irradiation. In this experiment, cases of inoperable uterine cancer were selected for the study. Blood-pressure determinations were made after the patient became quiet following irradiation and again after the subcutaneous injection of 0.7 c.c. of 1-1000 solution of adrenalin chloride. The blood pressure, pulsation, respiration, and other effects were carefully studied, at approximately five-minute intervals, for a period of sixty minutes following the injection.

It was observed that a definite fall in both the systolic and diastolic blood pressure readings occurred immediately following irradiation. In the majority of cases this fall was below 4 mm. Hg, and in the next largest group the fall was from 5 to 9 mm. Hg. However, it is of interest to note that after the sixth treatment some of the cases showed a rise in blood pressure. Subsequent to irradiation the usual rise in blood pressure following the injection of adrenalin was decreased. The palpitation, cyanosis, and other effects of adrenalin were slight or not evident in the irradiated cases. The author concludes that these changes resulted from the parasympathicotonia caused by radiation.

J. N. Ané, M.D.

GASTRO-INTESTINAL TRACT (DIAGNOSIS)

Radiologic Diagnosis of Diverticulosis of the Colon. H. Béclère and P. Porcher. Jour. d. Radiol. et d'électrol., July, 1930, XIV, 380-390.

A means of making a differential diagnosis between various types of diverticulosis of the colon is presented with radiographic evidence. Three types are distinguished as follows: False diverticula, formed only by folds of the mucosa; true diverticula, and those formed by a septum, due to perivisceral conditions.

True diverticula occur most frequently in the sigmoid or left colon, are seldom single, and never exceed the apparent volume of a large pea; they are usually asymmetrical, best seen by opaque enemas, and persist after evacuation of the segment. No modification of peristalsis occurs, but occasionally spasm is seen when they are the seat of inflammation.

False diverticula of the mucosa are seen in all parts of the colon, except the sigmoid, and are variable in number. The volume varies with the peristaltic rhythm (large in the ascending colon, in which long, strong contractions occur, smaller in the left transverse part, in which contractions are more rapid); they are never seen by an opaque enema but always following an opaque meal. After evacuation of the segment they disappear and cause no modification of the peristaltic waves.

Diverticula formed by a septum are seen especially at the level of the hepatic angle and the external border of the right and the superior border of the right transverse colon. The number is very variable and the volume can be enormous, depending on the adhesions. They can be visualized by either

method; the general contour is not preserved after evacuation, and the peristalsis is modified on the face involved.

The most common error is to mistake a normal fold of the colon for a diverticulum. Although after complete evacuation of the colon the true diverticulum can be identified, it is usually very difficult, with a barium meal, to differentiate between a false and a true one. Recourse to a barium enema, preceded or not by an antispasmodic, is indicated whenever possible. The distention created by the enema permits individualization of these diverticula with much less chance of error. When infected, diverticula are seen, spasm occurs, which resists the action of belladonna and enema. The contour of the colon can become plaited (accordion-like), as in colitis; the peristaltic contractions are less deep, but closer. The segment is comparatively empty and non-expansible.

B. J. DeLaureal, M.D.

Roentgenography of the Normal Relief of the Mucous Membrane of the Stomach and the Technic of Its Investigation. V. A. Fanardjev. Vestnic Röntgenol. i Radiol., 1931, IX, 270.

The relief of the mucous membrane of the stomach is studied after the introduction of a small amount of thick barium mixture. Roentgenograms are taken with the patient in the erect and recumbent positions, at various degrees of pressure. In normal cases the internal relief of the body of the stomach is characterized by four longitudinal folds which are parallel to each other. In the pyloric region the course of the folds varies considerably. They may be longitudinal, oblique, or even transverse. The width of the folds and their intervals vary from 0.5 to 0.6 cm. under normal conditions. The paper is illustrated by a number of figures.

Samuel Brown, M.D.

Radiologic Examination of Non-surgical Conservative Disinvagination of Acute Invagination in Children. Jacob Nordentoft. Jour. Rad. et d'électrol., July, 1930, XIV, 369-379.

Most surgeons are skeptical of this method chiefly because of the uncertainty of the return of the intestine to its normal position, until the first spontaneous stool occurs. The Swedish doctors, Yngve Olsson and Gustav Pallin, and, later, Arntzen and the author proposed this maneuver under X-ray guidance, following a barium lavage. This was done in 108 cases. Fifty-six gave perfect results, and four cases were unsuccessful. Three of these had ileocecal invaginations; another a colo-cecal affair. Of the 54 cases operated on, only one died; the rest were cured. Practically all had repeated lavages under increasing pressures. Eleven case histories are presented with accompanying radiologic illustrations.

The author has found the same radiologic evidence presented by Brocq and Gueullette; that is, arrest of a column of barium following a regular concave line, moulding with a clear convex zone, and carrying at times in its axis an obscure defile, more or less sinuous—the effects of abnormal shortening of a colonic segment.

He believes that if the X-ray study does not show the typical form of colocolic or ileo-cecal colic invagination with concave limitation of the barium column in some part of the colon, but bizarre forms, the attempt at non-surgical relief should be abandoned. Again, in ileo-colic invaginations surgical intervention should be done without delay. X-ray studies are easy and rapid and prevent loss of time in attempts at reduction when operations are indicated.

He concludes that radiologic examination will become an aid of certain importance in the diagnosis and therapy of this disease. When non-surgical reduction is done, the success and progress can be observed and the hours of doubt and suspense relieved while waiting for the appearance of normal stools three days later.

B. J. DeLaureal, M.D.

Interposition of the Large Bowel between the Liver and the Diaphragm. M. Z. Rotenfeld. Vestnic Röntgenologii i Radiologii, IX, Nos. 2 and 3, p. 153.

The diagnosis of interposition of the large bowel between the liver and diaphragm depends upon roentgenologic investigation of the gastro-intestinal tract. There is no symptom-complex which would lead the clinician to suspect its presence. The only characteristic and pathognomonic sign of this condition is the roentgenologic demonstration of the large bowel between the diaphragm and liver. The author believes that ptosis of the liver may have something to do with this anomaly. In general, it is found but rarely and is of very little clinical significance.

Samuel Brown, M.D.

Interposition of the Colon between the Liver and Diaphragm. J. Trémolières and André Tardieu. Arch. d. mal. de l'app. digestif, December, 1931, XXI, 1154-1198.

Often these conditions are looked upon as constituting a harmless abnormality or as due to flatulence, but after the authors had studied 19 such cases in one year, they were confirmed in their first observa-

tions, namely, that this condition results from perivisceral adhesions. The authors have reported certain pathologic findings and diagnostic peculiarities, which clear up the symptomatic significance.

In a radiologic study of this anomaly, following its suspicion from percussion, one notices below the diaphragmatic spherical vault, in the middle of the hepatic shadow, a region of lesser density, and, outside of this area, a clear area of variable extent, which may be as large as the hand, uniform or streaked by a fold of the colon.

An opaque substance ingested from seven to ten hours before examination reveals the right half of the colon, or the barium enema finds its way into the clear pocket outside of, or in front of, the liver.

Usually the hepatic flexure is found between the anterior surfaces of the liver and diaphragm, rarely between the liver and the axilla. Occasionally the shadow is that of a very long sigmoid colon or possibly the cecum. It is not always permanent and may disappear upon the patient's changing position. It is more apt to be present when the patient is in the erect posture, and the weight of food or barium may displace it below the liver.

Besides the various etiologic factors brought out by different authors, such as change in abdominal pressure, diminished volume of the liver as a result of disease or change in the ligaments, adhesions as a result of appendicitis, gall-bladder disease, gastric ulcers, inflammation of the cecum, and any other condition that may produce peritoneal irritation must be added. This has been proven by cases upon which operation has been done: three showed the presence of ulcers, new or old; 10, chronic appendicitis; four, chronic colitis of obscure origin, in some cases complicated by chronic cholecystitis; one evidenced cholecystitis alone. All showed adhesive perivisceritis. Pericolitis appears to be an element common to these various conditions, and it is primary or secondary to the subhepatic region. The colon is then necessarily adhesive to the liver, the flatulence forcing its interposition.

Treatment consists of hot applications to the abdomen, antispasmodics, as bromides and valerian, mixed vaccines, bismuth, kaolin, charcoal, and other treatments of colitis and limitation of fermentative hydrocarbons. Heliotherapy, ultra-violet and infrared rays, and diathermy may be tried for the perivisceritis. Massage and gymnastics may help. If no relief is obtained, resort may be had to surgery.

B. J. DeLaureal, M.D.

GENITO-URINARY TRACT (DIAGNOSIS)

Hydronephrosis. James Christiansen. Med. Bull. Veterans' Administration, December, 1931, VII, 1162-1164.

Complete obstruction of the urinary tract usually results in the cessation of secretion of urine by the kidney on the involved side, before the pelvis is dilated. However, intermittent or partial obstruction results in dilatation of the kidney pelvis. This dilatation may continue until the kidney tissue is completely destroyed so that only a thin wall of cortex may remain as a lining of the hydronephrotic sac. Obstruction of the urinary tract may result from the following causes: Inflammatory strictures; enlargement of the prostate or seminal vesicles; urinary calculi; angulation or kink of the ureter, and reflux from the bladder.

Hydronephrosis usually causes pain of a colicky character, and on physical examination tenderness and a palpable tumor may be found. Cystoscopic and roentgenologic examinations are valuable aids in establishing the diagnosis. The pyelogram will show the enlarged pelvis and will determine the size of the hydronephrotic sac.

The treatment of this condition consists of the removal of the obstruction and emptying of the pelvis. In those cases in which total destruction of the kidney pelvis has occurred nephrectomy is advisable.

The author reports a series of cases and discusses the diagnostic and therapeutic methods employed.

J. N. Ané, M.D.

GENITO-URINARY TRACT (THERAPY)

The Relation of Cystocele to the Upper Urinary Tract. Jefferson C. Pennington. Urol. and Cutan. Rev., January, 1932, XXXVI, 1-8.

The author discusses the importance of the association of cystocele and lesions of the upper urinary tract, and urges the closest co-operation of the gynecologist and urologist in the treatment of these cases. While the causes of cystocele are very numerous, it is believed that most frequently it results from trauma and perineal lacerations following childbirth. Congenital tissue weakness, senility, uterine tumors, and general abdominal ptosis are other etiologic factors. The prominent symptoms are those due to vesical irritability.

Cystocele when far advanced is very easily recognized. Cases of lesser degree may escape detection if only casual inspection is resorted to. Cystoscopy is found a valuable aid in many cases. Employing the technic of H. G. Pretty, X-rays have been found serviceable in these cases. A 10 per cent solution of sodium iodide is injected into the bladder, while the patient is lying on her back on the table. She is then placed in the vertical position

and the X-ray tube centered over the symphysis pubis. The roentgenogram is taken while the patient is in the act of "bearing down."

Cystoceles do occur without associated pathology, and, in the opinion of the author, they should be severe enough to interfere with bladder function before they require especial attention. A cystocele with retention of urine is analogous to retention of urine in the male caused by prostatic obstruction. Cystitis follows as a result of retention of urine, and the infection spreads by direct continuity through the blood stream and lymph channels to the ureters and pelves of the kidneys.

Cystocele is very frequently associated with rectocele, which, in turn, results in intestinal stasis. The lymphatic systems of intestines and kidneys have been shown to be closely associated and this serves as a route of infecting organisms. It is also known that colon bacilli in passing through the kidneys will frequently attack the kidneys if for some reason the patient's general resistance has been lowered. As a result, the patient may have a pyelitis, nephroptosis, and rectocele associated with the cystocele.

The author is of the opinion that these patients should be examined carefully and thoroughly, so that rational and beneficial therapeutic methods may be planned.

J. N. Ané, M.D.

Radiation Therapy of Malignancies of the Bladder and Prostate. Ira I. Kaplan. Urol. and Cutan. Rev., January, 1932, XXXVI, 40-42.

It is generally agreed that, as in malignancy situated elsewhere, the best treatment for early lesions of the bladder and prostate is surgery, followed by irradiation. Unfortunately, however, the disease is fairly well advanced in the average case before the diagnosis of malignancy is made. Radiation therapy of these organs requires as careful and thorough a technic as the surgical form of therapy.

Radiation therapy in genito-urinary work advanced with the advent of the manufacture of glass tubules of radium gas by Dominici. While the results obtained at first were found encouraging, it was observed that marked necrosis of all tissues followed the application of these tubules. The metal filtered tubules were found very much more satisfactory, as the metal filtered off to a large extent the corrosive rays of the radium emanation and produced a much more efficient gamma effect on the irradiated tissues.

Regaud reaffirmed the axiom that the best form of radium therapy is that produced by applying to the lesion a small quantity of radium properly filtered, over a long period of time. Utilizing this theory, there has been devised a method of treating cancer of the cervix uteri, which has replaced operative procedures for this condition in most of the clinics here and abroad. This technic replaced the older intratumoral puncture method in the treatment of cancer of the rectum and cervix in the author's service. The results were so favorable in these cases that he next devised a technic for the application of this form of irradiation to malignancies of the bladder and prostate.

In the case of cancer of the bladder, after a preliminary suprapubic cystotomy, a stay suture is placed in the bladder wall in close proximity to, and on either side of, the lesion. This suture is so inserted as to leave a loose loop between needle holes in the cavity, and the ends of the sutures are brought out in the suprapubic opening. The radium tube is then placed in a rubber tube which is tied at both ends with the long ends of the thread remaining. The radium tube is then placed in position about the lesion to be treated. The long threads from the tube are carried under the loop of the stay sutures on either side of the lesion, brought out through the suprapubic opening, and anchored on the abdominal wall by adhesive tape. From one to four tubes are used about the periphery of the lesion. The dosage employed depends upon the size of the lesion and varies from 2,000 to 5,000 milligram-hours. The tubes, containing from 5 to 15 milligrams of radium or radon, are filtered through from 1 to 1.5 millimeter thickness. The bladder is irrigated daily with boric acid solution.

At the conclusion of the treatment one end of the stay suture is cut close to the suprapubic orifice and traction applied to the other end, the stay suture being withdrawn from the bladder. The other suture is released in the same manner and the radium tube is drawn through the suprapubic opening.

Radium therapy is applied to the prostate by exposing the prostate through the usual perineal incision. The levator muscles are separated and the urethra and rectum separated from the prostatic capsule by blunt dissection. Then holes are made through the capsule and extended into the gland proper by means of a large curved artery forceps. After the radium tubes are pushed into these holes, the wound is packed with iodoform gauze, and closed in the usual manner, leaving a skin opening at one side from which the ends of the tube threads and the iodoform gauze protrude. From 5 to 15 milligrams of radium are used in each tube and a total dose of from 200 to 500 milligram-hours is given. In cases in which symptoms of urinary obstruction are present, a suprapubic cystotomy is done for bladder drainage before radiation treatment is given. This wound can usually be closed after radium treatment.

J. N. Ané, M.D.

GYNECOLOGY AND OBSTETRICS

The Pre-operative Irradiation of Uterine Carcinoma. A. Mayer. Strahlentherapie, Nov. 14, 1931, XLII, 759-768.

During the period from July, 1926, to October, 1931, the author observed 91 cases of uterine carcinoma irradiated before operation. From 1927 to 1929, there was no operative death and the total mortality in five years amounted to only four, or 4.3 per cent. Two of these cases died from cachexia, one from heart disease, and only one after operation, from peritonitis. Roentgen rays and radium were used in combination, or radium alone. No definite information as to the radiosensitivity of the tumor could be obtained either from the clinical picture or from the histologic study of a section. It also appeared that temporary clinical cure and permanent or anatomic cure do not always run parallel. Of 101 women who were operated on, three months after irradiation the carcinoma had disappeared from the surface in 56 cases, while in only 20 of these microscopic examination of the removed uterus revealed no cancer tissue. No definite statistical figures as to five-year cures can be given at the present time.

The author concludes that undoubtedly pre-operative irradiation improves the chances for operation. It helps in rendering the operative area aseptic and decreases, therefore, the percentage of post-operative peritonitis. As a preliminary figure of cures, he gives 41.3 per cent for pre-operative irradiation and operation, as compared with 31 per cent for operation alone.

ERNST A. POHLE, M.D., Ph.D.

The Influence of the Irradiation of the Hypophysis upon the Female Genitals. S. Suzuki. Japanese Jour. Obst. and Gynec., October, 1931, XIV, 393-399.

The relationship of the hypophysis to other endocrine organs has been proved by many investigators. Long and Evans, and later Aschheim and Zondek demonstrated the effect of the pituitary hormone upon the genitals. The author studied the secondary effects upon the female genital organs caused by irradiation of the hypophysis. Albino rats were chosen as experimental animals and immobilized so that only the heads of the rats were irradiated. The factors employed were as follows: Effective voltage, 159 K.V.; 2 ma.; skin focal distance, 23 cm.; filtration, 1 mm. Al plus 0.5 mm. Zn; the shortest wave length, 0.09-0.095 A.E.

The rats were divided into three groups and designated as A, B, and C. A group was irradiated for a period of twenty minutes, seven or eight times at intervals of from one to five days. B group received three irradiations of forty-five minutes each at intervals of from two to seven days. C group was irradiated three times at intervals of one or two days for a period of sixty minutes, each time. From 137 to 166 days were required for the experiment.

Immature rats were also employed and divided into three groups, these groups receiving ten, fifteen, and twenty minutes' irradiation, respectively. These animals received eight treatments, for at the onset of estrus the irradiation was discontinued and changes in the body weight and sexual cycle observed. This study lasted 166 days.

Of the five cases irradiated eight times for a period of twenty minutes each time, two cases showed a lengthening of the sexual cycle, and in the remaining three cases the change was not so marked. Of the five cases irradiated three times for a period of forty-five minutes each treatment, a definite change and lengthening of the sexual periodicity occurred, no change occurring in the other two cases. Of five cases irradiated for a period of sixty minutes from four to six times, four revealed a longer interval and one case showed no change. While the immature rats, which had been irradiated from fifteen to twenty minutes, revealed a marked decrease in rate of growth, none of the animals showed any change in the onset of estrus as compared with normal controls.

The author concludes that secondary changes do occur in the ovaries, as a result of irradiation of the hypophysis. He further believes that the results obtained in the irradiated immature rats prove the existence of a hormone accelerating the bodily development in the hypophysis.

Using identical material and methods of irradiation, the author studied also the effects of adrenalin, pilocarpine, and barium on the uterine movement of the irradiated and normal control animals. It was observed that the extirpated uterus of the irradiated rat demonstrated a decrease in sensibility to adrenalin and barium. However, in some cases the reverse effects were noted following the use of adrenalin. Very little or no decrease in sensibility to pilocarpine was noted.

The author is of the opinion that irradiation of the hypophysis produces an atrophy and consequent hypofunction in this organ which results in a secondary atrophy of the genital organs and decrease in sensibility to the usual uterine stimulants.

J. N. ANÉ, M.D.

THE JOINTS

Synovial Fluid. Editorial. Jour. Am. Med. Assn., Dec. 26, 1931, XCVII, 1969.

The composition of the synovia is not constant but differs in rest and motion of the joints it bathes.

There is a notable distinction between the fluid and blood plasma or ordinary lymph, presumably due to a mucin-like substance in the synovia. The exact nature of the mucinous constituent remains unknown.

Fremont-Smith and Dailey concluded that the equilibrium between plasma and synovial fluid is of the same nature as that between plasma and peritoneal or pleural effusions. Kling found the viscosity of normal, and the majority of pathologic, synovial fluids to be higher and the range of variation greater than that found in plasma and exudates. The mucinous substance is recognized to be a physiologic product. Inflammation and irritation tend to increase its output. Kling believes the structure and function of the synovial membrane are twofold: one part being for mechanical binding of the epiphyses and the other for maintenance of smooth motion and lubrication. The secretory element is best developed in the knee joint and less well developed in the wrist and tarsal joints. Motion is the natural stimulus for the secretion of synovia, as is food for the secretion of gastric juices. The detrimental effect of immobilization, especially in knee joints, is therefore explained by the interference with this secretion in a joint highly adapted to it.

C. G. SUTHERLAND, M.D.

Patella Partita. Werner Feistkorn. Röntgenpraxis, Oct. 15, 1931, III, 945-951.

The differentiation of a patella partita from a fracture of the patella is not always easy. Comparison of the affected knee with the other knee is very important, if one wants to avoid mistakes, which are especially disagreeable in insurance cases. In the majority of cases, this anomaly is found bilateral.

The case described showed multiple, separate portions of the patella. The pathogenesis of the patella partita is not yet clear. Some authors think of a congenital deformity caused by separate centers of ossification, while others consider an osteochondritic lesion (with "Umbauzonen") similar to Osgood-Schlatter's disease. A slight trauma and excessive muscle traction might be factors. In the case described no fracture could be shown, except a very small fragment. However, many months afterwards the picture of a patella multipartita appeared. Both knees showed several centers of ossification.

H. W. HEFKE, M.D.

LEAD POISONING

Roentgenologic Diagnosis of Lead Poisoning in Infants and Children. Edward C. Vogt. Jour. Am. Med. Assn., Jan. 9, 1932, XCVIII, 125-129.

Since August, 1929, thirty-two cases have been diagnosed in his clinic. Quite a number were detected in the roentgenograms before otherwise suspected. The most frequent source is from paint off furniture, woodwork, and toys. Symptoms occur most commonly between the ages of one and two years, and are chiefly neurologic and gastro-intestinal. A secondary anemia is usual. Basophilic stippling of the red blood cells is considered one of the most reliable observations. The lead line in the gums is seldom seen in children.

A roentgenologic sign is a dense band at the growing margins of all bones, being most evident at the ends of the long bones and anterior ends of the ribs. It must be differentiated from rapidly healing or recently healed rickets, or changes following severe nutritional disturbances with retarded growth of bone.

C. G. SUTHERLAND, M.D.

RADIATION

Fluctuations of the Lactic Acid Content of the Blood Following Roentgen Exposures of Normal and Pathologic Body Tissues. J. Heeren and R. Hummel. Strahlentherapie, Nov. 14, 1931, XLII, 784-792.

In a series of patients who received X-ray deep therapy the lactic acid content of the blood was determined. It appeared that if normal tissues of patients who had no malignancy were irradiated, there was no increase of the lactic acid content in the blood; no patients showed a decrease immediately following irradiation. Patients with malignant neoplasm responded as a rule with an increase in the lactic acid content of the blood immediately after irradiation. If they were treated over normal tissues, as, for instance, over the thigh on another occasion, the lactic acid content of the blood was found decreased immediately after irradiation. The irradiation of tuberculous or other pathologic tissue, with the exception of neoplasm, also brings about a decrease of the lactic acid content of the blood. This change is usually of short duration; two hours after irradiation it may have already disappeared.

ERNST A. POHLE, M.D., Ph.D.

Sources of Radiation and Their Physical Characteristics. W. W. Coblentz. Jour. Am. Med. Assn., Dec. 26, 1931, XCVII, 1965-1967.

Recent additions to the physical therapist's armamentarium are the so-called cold red ray and cold quartz ultra-violet ray lamps. The term "cold ray" is a misnomer. Thermal radiation of all wave lengths (whether ultra-violet, visible, or infra-red rays), when absorbed, produces heat. The reason these two

sources do not have a sensible heating effect and the burners do not become highly heated is that very little electric power is put into the lamps and little radiant power is emitted.

A description of the light and comparison of units are given.

He comments on the difference in the physiologic action of ultra-violet rays of wave lengths less than 265 millimicrons in artificial sources and those from 310 to 315 millimicrons, which are very intense in sunlight. It will require a long time to inform the public of the importance of timing the sunbath to avoid severe burns. Many painful burns could be avoided by warning.

C. G. SUTHERLAND, M.D.

ROENTGEN-RAY (INDUSTRIAL APPLICATION)

Practical Application of X-ray Diffraction Methods in the Study of Quench and Temper Structures of Carbon Spring Steels. N. P. Goss. Trans. Am. Soc. Steel Treating, 1931, XIX, 182-192.

X-ray diffraction methods show that quenching and temper structures are quite independent of each other. The ill effects of improper quenching cannot be removed by tempering, which only facilitates the precipitation of Fe_3C; the α-Fe matrix is not changed. X-rays will determine whether the proper quench structure was obtained, even though the steel has been tempered. Diffraction patterns are given.

CHEMICAL ABSTRACTS.

Radiography by the Use of Gamma Rays. Robert F. Mehl, Gilbert E. Doan, and Charles S. Barrett. Trans. Am. Soc. Steel Treating, 1930, XVIII, 1192-1227; Jour. Inst. Metals, 1931, XLIV, 606.

A preliminary paper on the examination of metals by γ-rays from radio-active substances. Radiographs were obtained of steel, the thickness of which far exceeds that possible for X-rays. Ten inches of steel has been penetrated with slight success. Three methods were used: *(a)* Ionizing effects of the γ-ray; *(b)* fluorescent screen, and *(c)* photographic film. The last gave best results. Exposures of one hour per inch of thickness of steel, with 18 inches distance source to film, gave good results. Photographs are given.

CHEMICAL ABSTRACTS.

THE SINUSES (DIAGNOSIS)

The Relation of the Sphenoid Sinus to Dysfunction of the Pituitary Gland. S. Bockoven. Med. Bull. Veterans' Administration, January, 1932, VIII, 43, 44.

Anatomically, the pituitary gland is separated from the sphenoid sinuses by only a thin layer of bone. The optic chiasm is situated almost immediately in front of the pituitary, which accounts for the findings in the eye grounds which are sometimes observed in posterior sinus disease. In like manner, pathologic changes in the optic tract in some cases result from disease of the sphenoid sinuses.

The author emphasizes the necessity of a complete and careful study of the sphenoid sinuses in all cases of pituitary dysfunction, such as is found in diabetes insipidus. He cites the case of an ex-service man who was admitted to the hospital because of polyuria, nocturia, and a disturbance in vision. A careful examination of his sinuses, including lipiodol injection and roentgen examination, revealed definite evidence of sphenoid disease. The sphenoid sinuses were treated, and the patient experienced considerable relief of his symptoms.

The author is of the opinion that further study along these lines may reveal other evidence of disturbance in the function of this gland, due to irritation in this region, secondary to definite disease of the sphenoid sinuses.

J. N. ANÉ, M.D.

THE SKIN (GENERAL)

Acne: A Statistical Study of Possible Related Causes. Ruby L. Cunningham and C. J. Lunsford. Calif. and West. Med., July, 1931, XXXV, 22-26.

In this study of acne the authors have used young women students entering the University of California. The physical examination showed acne in 23.7 per cent, or 2,974 students. They selected 3,185 students out of those without acne to represent a control group. They compared the weight of these groups as to overweight and underweight. Very little difference in percentage was found in the two groups, namely, "acne present" and "acne not present." Again, a comparison, using the complexion, showed very little difference. Using the menstrual history, the difference was found to be very small.

Regarding infections, such as boils, appendicitis, tuberculosis, tonsillitis, constipation, headache, etc., one is again struck by the similarity of percentages in the two groups. A little difference was found in

the adolescent enlarged thyroid groups, the "acne present" group showing 27.2 per cent as against 21.8 per cent in the "acne not present" group. Again, comparing the nose, tonsils, and eyes, we have a very little increase in percentage in the "acne present" group over the other.

In their conclusions, the authors note: "If we accept the theory that acne is due to an infection, this study would indicate that the infection is little influenced by systemic conditions."

FRANCIS B. SHELDON, M.D.

THE SKIN (THERAPY)

A Case of Calcinosis Universalis, and a Suggested Method of Treatment. John Craig and Alexander Lyall. British Jour. Child. Dis., January-March, 1931, XXVIII, 29-34.

A case of calcinosis universalis is reported in a child of five years. Hard lumps could be felt beneath the skin and X-ray plates showed diffuse calcification in the subcutaneous tissues. The child was given iodides, with massage, for three months without benefit.

Di-sodium phosphate by mouth was then substituted, in half-drachm doses three times daily for a week, then one drachm four times daily. In six weeks' time the masses had almost gone and very little calcification remained, as shown by subsequent X-ray examination. The authors give a short discussion of the rationale of this treatment.

E. C. VOGT, M.D.

Light Therapy in Skin Diseases. Walther Schultze. Strahlentherapie, May 20, 1931, XL, 601-610.

This is a brief general discussion of the present status of light therapy in dermatology. The various schools of teaching are mentioned, and the importance of medical supervision is stressed. As far as the dosage of light is concerned, the author feels that the reproductivity of doses applied to the patient is a necessity.

"However," he states, "we do not know enough to-day concerning the biologic effect of various parts of the spectrum to permit the adoption of a definite unit similar to the r in roentgen therapy."

ERNST A. POHLE, M.D., Ph.D.

A Few Remarks about the Treatment of Rhinophyma. Albéric Marin. Canadian Med. Assn. Jour., November, 1931, XXV, 589-591.

Rhinophyma is the monstrous hypertrophy of the end of the nose. This deformity is the final evolution of the rosacea, with folliculitis.

The local treatment of rhinophyma differs according to the stages of its evolution. At the onset, when it is still a rosacea, strong sulphurated lotions, and, notably, cryotherapy give excellent results. Carbonic dioxide snow is the treatment of choice for the rosacea when it presents but little folliculitis and fine telangiectasiæ. Massage is a good adjunct.

At a later stage, when the skin is hypertrophied and the small veins which run into it are numerous and dilated, and folliculitis is marked, we must have recourse to more active measures. Positive electrolysis will block the vessels. Crossed linear scarifications will chop the telangiectasia and the sebaceous glands. Careful applications of filtered X-rays will diminish the recurrence of folliculitis. Nevertheless, these diverse treatments are insufficient when the affection becomes a genuine rhinophyma and the nose develops extraordinary proportions. We must then act energetically to free the patient from this deformity.

Decortication is the operation to be adopted. This consists in removing the surplus tissue, care being taken not to go too deeply, in order to leave sufficient tissue for epithelialization. Some authors recommend the use of high frequency currents, employed either for coagulating the rhinophyma or for endothermic ablation. The author does not recommend this procedure, because it is lengthy and uncertain in its results.

X-rays and radium are not of any use to reduce a rhinophyma. We would have to use such high doses as to cause severe radiodermatitis long before the nose would diminish in size.

The author presents photographic reproductions to illustrate one case treated by the surgical method.

L. J. CARTER, M.D.

The Distribution of Roentgen Rays in the Skin. V. Wucherpfennig. Strahlentherapie, Oct. 24, 1931, XLII, 544-550.

The author states that isodose charts for radiation used in skin therapy have not been measured so far. It is necessary, therefore, to calculate the distribution of radiant energy in the skin. The accuracy of such a calculation depends, greatly, of course, on the conditions found in the individual case. A method is shown which permits the determination of the depth dose in superficial therapy by using the mass absorption coefficient for air and water. The results are recorded in a schematic cross-section of the skin, thus enabling the radiologist to read off the "depth dose" for radiations with a half value layer in Al from 0.25 to 4.0 mm. in the first 12 mm. of skin.

ERNST A. POHLE, M.D., Ph.D.

Action of Roentgen Rays of Different Quality on Psoriasis. G. A. Rost and Ph. Keller. Strahlentherapie, Oct. 24, 1931, XLII, 539-543.

The biologic effect of roentgen rays of different wave length has been most frequently compared on the basis of the skin erythema. The authors used a different reaction, namely, the changes produced in psoriatic lesions. The following qualities of radiation were used: 45 K.V., no filter; 75 K.V., no filter; 75 K.V. 1 mm. Al; 138 K.V. 4 mm. Al; 138 K.V. 0.5 mm. Zn. The half value layers in Al were 0.3, 0.5 1.5, 8.0, and 12.0 mm., respectively. Their therapeutic action on the skin lesions amounted to 150 per cent, 110 per cent, 110 per cent, 100 per cent, and 100 per cent, respectively, for the various qualities used. As a rule, the authors applied 100 r three times at ten-day intervals. It is also sometimes possible to remove the lesion in one sitting by from 300 to 400 r of a radiation with 0.5 mm. Al H.V.L. If 600 r were applied, the lesions healed temporarily but recurred soon again.

From these observations the authors conclude that the longer wave length radiation is preferable. It would be possible to give 100 r two or three times at ten-day intervals over the scalp without producing epilation, provided a radiation with the H.V.L. in Al of 0.3 mm. was used. If a higher H.V.L. was chosen, epilation often occurred. It must be remembered, however, that the soft radiation cannot be measured well with the Sabouraud-Noiré pastille. It is necessary to correct for penetration. According to their experience, one Sabouraud-Noiré dose corresponds to 550 r for a half value layer in Al of 0.28 mm., to 443 r for a half value layer in Al of 0.35 mm., to 317 r for 1 mm. H.V.L., to 248 r for 1.5 mm. H.V.L., to 293 r for 2.5 mm. H.V.L., and 224 r for 3.4 mm. H.V.L.

ERNST A. POHLE, M.D., Ph.D.

THE SKULL (DIAGNOSIS)

Our Experience in Encephalography in Some Diseases of the Nervous System of the Child. Piero Sighinolfi and Carolina Viola. La Radiologia Medica, December, 1930, XVII, 1432-1456.

The authors have performed encephalography on ten young patients for purely diagnostic purposes, using Biengel's method. Although the cases selected were in extremely serious conditions, no operative mortality followed; nausea and vomiting were the only consequences observed.

The diagnostic points observed were undoubtedly precise, but the authors, nevertheless, think that encephalography is to be resorted to only in very special cases, because very little is to be gained, as far as curative treatment is concerned, by knowing exactly the position of a cerebral tumor.

They believe that pre-operative roentgenotherapy is advisable in conjunction with Biengel's method, because it will prevent sudden increases in liquid pressure.

L. MARINELLI.

A Special Technic in X-ray Stereoscopy. DeWitt R. Austin. South. Med. and Surg., October, 1931, XCIII, 755.

The technic described is for use with the Bucky diaphragm at a distance of twenty-seven inches, and consists in shifting just half the usual distance with the tube. This furnishes a geometric correction for the increased distance between object and film, when using the Bucky grid. It is especially useful in securing stereoscopic films of the head.

W. W. WATKINS, M.D.

Arterial Encephalography. Egas Moniz. Bruxelles-Méd., Nov. 1, 1931, XII, 22, 23.

By the method of producing opacity of the arterial cerebral plexuses, the author has been able to localize tumors which clinical symptoms have failed to reveal.

Patients are prepared on the night preceding the operation, or on the morning of the operation, by luminal, with a view to avoid or diminish the epileptic symptoms which usually follow the injection, either of the internal carotid or of the common carotid. The vessel is exposed; if the common carotid is selected, the external carotid is temporarily obliterated with a Martins forceps in order that the opaque liquid may pass exclusively through the internal carotid.

The patient is placed under the X-ray tube, and is injected with from 5 to 6 c.c. of a solution of chemically pure sodium iodide, 22 or 23 per cent. A Martins forceps clamps the artery below the needle so as to momentarily block the circulation, although this precaution is not essential to allow the visibility of the cerebral arteries.

The one contra-indication is advanced arteriosclerosis; however, if the sodium iodide is chemically pure, complications are very rare.

The encephalographic test demonstrates the visibility of the internal carotid, especially its cavernous portion and the ophthalmic, anterior choroid, the sylvian group, and sometimes the anterior cerebral and its subdivisions.

The localization of certain very vascular tumors is detected by the visibility of their circulations; their arteriographic aspects are different. Paucity of vascularity is found in cysts and cholesteatomas,

quite the contrary being found in meningoblastomas and other highly vascularized tumors.

Arterial displacements facilitate the diagnosis of tumors of the frontal, parietal, and temporal lobes and, among others, of the regions of the chiasma and ponto-cerebella angle.

HENRY BAYON, M.D.

Skull and Brain Traumas: Their Sequelæ. Mark Albert Glaser and Frederick P. Shafer. Jour. Am. Med. Assn., Jan. 23, 1932, XCVIII, 271-276.

Two hundred and fifty-five cases were followed, one as long as five years after the accident. The series was subdivided into groups, depending on the presence and location of fracture the diagnosis of which was determined by roentgenography. Rupture of the ear membrane, with resulting hemorrhage or a distended bluish membrane, occurs with sufficient frequency to be utilized as a practical criterion of fracture through the petrous portion of the temporal bone. Mental disturbances and convulsive states were the only changes that manifested themselves at a period later than three months after injury.

In patients suffering from depressed fractures symptoms are less likely to develop than in those without fracture. Combined fractures of the base and vault are the most serious. The younger the patient, the less likely it is that symptoms or signs will develop. Headache was the most frequent complaint and developed more often in cases without skull fracture. Headaches persisting over one and a half years usually were permanent. Dizziness occurred more frequently in fractures of the base. Very little opportunity for recovery was evident when it persisted over one and a half years. Results of trauma affecting various nerves are reviewed. Positive neurologic signs occurred in 32.5 per cent while 80 per cent presented subjective complaints.

C. G. SUTHERLAND, M.D.

THE SPINE (DIAGNOSIS)

Absence of the Cervical Spine: Klippel-Feil Syndrome. George I. Bauman. Jour. Am. Med. Assn., Jan. 9, 1932, XCVIII, 129-132.

Anomalies in the cervical spine are uncommon and especially rare are those described under the obscure term of the Klippel-Feil syndrome. This consists of a numerical variation in the cervical vertebræ accompanied in some cases by spina bifida or other anomalies. About thirty such cases have been reported, mostly in the French literature; three cases have been reported in America and one in England.

Five cases are reported and reviewed. Inability to dissociate the movements of the two hands, a phenomenon designated as mirror movements, was seen in four. The changes are all intra-uterine. A developmental anomaly primary in the nervous system, with an accompanying or resulting bone anomaly, may be assumed in a large percentage of cases. No treatment is of any benefit. Operations or active treatment should be avoided by a correct diagnosis.

C. G. SUTHERLAND, M.D.

Typhoid Spine. L. K. Wang and Leo J. Miltner. Chinese Med. Jour., January, 1932, XLVI, 1-11.

The name "Typhoid Spine" was given by Gibney, in 1889, to a condition of the spine occurring in the wake of typhoid fever and characterized by pain and tenderness of a part of the vertebral column. Bone marrow in common with lymphoid structures offers a favorable location for the growth and multiplication of typhoid bacilli. After the general infection has subsided, the bacilli may be destroyed by the protective agents present, or may remain quiescent for a time, later becoming active. Muscle strain, trauma, fatigue, and exposure are considered as possible etiologic agents.

The three types of typhoid spine recognized pathologically are as follows: (1) Diffuse periostitis and perispondylitis with roentgenologic appearance similar to osteo-arthritis; (2) the localized or common type, with early destruction of the intervertebral disc. In this type healing occurs promptly, and (3) extensive destruction, as in osteomyelitis, with pronounced gibbus formation. Roentgenograms show at first marked bone destruction, and later filling out of the destroyed areas with marked osteogenesis between the vertebral bodies. The intra-articular facets, pedicles, transverse processes, and laminæ are not involved in any of these types except late in the healing stage, at which time these structures may show evidence of osteo-arthritis.

The onset may be insidious or sudden, with rise in temperature and severe pain in the affected region. Local tenderness and rigidity are nearly always present. Various sensory disturbances in regions supplied by the nerves of the affected levels have been described. The blood count is considered of no value in the diagnosis.

Tuberculosis of the spine, osteomyelitis of the spine, and low back pain of arthritic nature must be considered in the differential diagnosis of typhoid spine. At the onset of clinical symptoms of sufficient importance to demand attention in tuberculosis of the spine, the X-ray usually reveals the existence of an extensive lesion, whereas in typhoid spondylitis an early X-ray examination shows either no change or slight destruction of the intervertebral disc. If the history of typhoid fever is indefinite

and the X-ray suggests the possibility of either condition, the Widal test aids in the diagnosis. In typhoid spine, as a rule, there is definite roentgenographic evidence of bony condensation and ankylosis of the involved vertebræ within three or four months' time, whereas in tuberculosis of the spine similar evidences of healing, if present, occur usually from two to ten years after the onset. The presence of a spinal abscess is strongly in favor of tuberculosis. In acute osteomyelitis of the spine the local phenomena are intense and the leukocyte count is, as a rule, very high. Low back pain of arthritic nature may be eliminated by the history of onset, the absence of a history of typhoid fever, and the absence of changes demonstrable by the X-ray.

The prognosis in this condition is almost always favorable and with proper treatment very little deformity results. The treatment consists of proper immobilization of the spine during the acute stage, typhoid vaccine, foreign protein therapy, colonic irrigations, and complete rest in bed until all pain has passed and the roentgenograms show evidence of healing of the affected vertebræ.

The authors report two cases of typhoid spine, one of which also presented a sacro-iliac arthritis of similar etiology.

J. N. Ané, M.D.

Scoliosis: Etiology, Pathogenesis, and Prevention of Experimental Rotary Lateral Curvature of the Spine. Eben J. Carey. Jour. Am. Med. Assn., Jan. 9, 1932, XCVIII, 104-110.

Scoliosis is now definitely known as rotary lateral curvature of the spine. It is a spinal sign of the muscle-bone imbalance of the back, and not a specific disease entity. The kind and degree of scoliosis are dependent on the extent of imbalance caused by the possible multiple combinations and permutations of the paralyzed muscles of the body as a whole.

The problem of scoliosis is one of prevention of all conditions that upset the normal balance of muscle and bone during growth, such as chronic inanition and malnutrition and the various types of chronic disease which lead to undernourishment of the growing child.

C. G. Sutherland, M.D.

An Hemangioma of a Vertebra, Demonstrated Roentgenographically. A. Reisner. Röntgenpraxis, Oct. 1, 1931, III, 900-903.

Hemangiomas of a vertebra are not rare in autopsy material (from 10 to 12 per cent). Clinically they occasion symptoms only when they cause pressure on the spinal cord. The roentgen appearance of a vertebral hemangioma is typical, if one consults the literature. The bony portion of the vertebra (usually a lower thoracic or upper lumbar) only is attacked, the discs are intact, the normal bone structure is changed into dense, calcified strands, which run mainly in a vertical direction and enclose areas where calcium is absent. A case is described which showed all these signs in the tenth dorsal vertebra.

H. W. Hefke, M.D.

Evaluation of the Different Symptoms in Diagnosis of Conditions of the Vertebræ. Hans Hellner. München. med. Wchnschr., Sept. 4, 1931, LXXVIII, 1511-1515.

In the diagnosis of injuries and diseases of the spine, the roentgen findings are usually of more value than the clinical examination alone. The X-ray gives more detail as to conditions of the body of the vertebra, the inter-vertebral disc, the degree of bone destruction, and of accompanying spondylarthritis or synostosis. Fractures occur most frequently in the twelfth dorsal and first lumbar vertebræ. Regarding the type of fracture, the compression leaving a wedge-shaped body is the most common. With increasing force of the impact, the vertebra receives the shape of a disc, with the anterior portion of the body protruding in front of the spine, and even breaking off in a triangular shape. Luxation plus fracture is due to a tearing off of the lateral portion of the vertebra. Tuberculosis also has its place of predilection. Bergmann found, in 342 cases, the twelfth dorsal in 24.6 per cent, the eleventh dorsal in 20.5 per cent, and the first lumbar in 18.7 per cent of the cases involved. The majority of cases has more than one involved. The inter-vertebral disc is usually affected. A gibbus, with angulation of the spine, occurs early. Roentgenologically, the disc is not narrowed in fractures. Only in very severe cases of compression do we find a narrowing; but in tuberculosis one frequently finds a moth-eaten defect. This can be used for differential diagnosis between a healed fracture and a tuberculous process. Even if a fracture has resulted only in an injury to the disc and has injured the anterior part of it, with bridge formation, the rest of the disc is smooth—a condition which can never be seen in tuberculosis, although there are many ways to determine tuberculosis by the X-rays.

In some cases a healed fracture cannot be distinguished from a case of healed spondylitis (Köhler). The changes produced by typhoid, paratyphoid, grippe, or pneumococcic spondylitis are similar to those of tuberculosis and can be recognized only by considering also the clinical side of the case. Acute purulent osteomyelitis is characterized by the

acute septic condition of the patient and also by the almost ever-present purulent spinal meningitis. On the X-ray one finds destruction frequently in the arc of the vertebræ. In malignancy the metastasis may produce changes similar to those one sees in tuberculosis, but usually the formation of a gibbus is late. If the lesion is in the spongiosa it must be larger than the size of a pea in order to be recognized on the film. The differential diagnosis between carcinoma and myeloma is very difficult. Besides these osteoclastic types of lesions, the osteoplastic carcinoma and Paget's disease must be mentioned.

E. A. May, M.D.

A Case of Congenital Dorsal Scoliosis Associated with Bilateral Traumatic Paralysis of the Klumpke Type. Giulio Faldini. L'Ateneo Parmense (Suppl.), 1931, III, 108-116.

The radiographic examination showed a scoliosis of the right dorsal spine, with a steep curve, due to the subsequent malformations.

Interpretation of the case is difficult, owing to the fact that factors of various nature are encountered in a limited anatomic space, which must be evaluated in conjunction with each other in order that a clinically logical explanation of the syndrome may be reached. The paralysis was marked by characteristic atrophy, but without sensitive phenomena. The author concludes that the pathogenesis of the paralysis is not to be sought in the congenital deformity but that this must be regarded as merely a slight and occasional concomitant factor.

W. W. Whitelock, Ph.D.

Calcification of the Nucleus Pulposus of the Intervertebral Disc. Renato de Bernardi. Archivio di Radiologia, May-June, 1931, VII, 537-556.

The author thinks that this lesion is part of a morbid process which involves the whole intervertebral disc and is not a lesion *per se*. This process is of an inflammatory nature, due to some generalized infection which may manifest itself in the advanced stages, either as spondylitis deformans or as spondylitis of Bechterew's type.

E. T. Leddy, M.D.

An Erroneous Diagnosis of Fracture and Dislocation of the Second Cervical Vertebra. Emil Kleinhaus. Röntgenpraxis, Sept. 15, 1931, III, 836-839.

A diagnosis of fracture of the dens of the second cervical vertebra with anterior dislocation had been made in a patient, who suffered an injury to the head. The anteroposterior film through the open mouth showed no pathologic changes. On the lateral view the second vertebra seemed to be definitely dislocated anteriorly. This, however, can be explained by a wrong technic. The head and the first cervical vertebra were in a straight lateral position, while the rest of the cervical spine was rotated only 45 degrees. The same appearance could be duplicated in a normal person. The head and the cervical spine must necessarily be projected on the film from the same angle, in order to avoid diagnostic mistakes as the one described above.

H. W. Hefke, M.D.

Sacralization. R. Hirsch. Fortschr. a. d. Geb. d. Röntgenstr., August, 1931, XLIV, 215-226.

True sacralization, that is, synostosis of the fifth lumbar and first sacral segments, was not found in 1,000 lower spines studied during five years. Pseudosacralization, that is, uni- or bilateral articulation between the transverse processes of the fifth lumbar vertebra and the sacrum, was found in 1.3 per cent of these cases. In 2.4 per cent, the transverse processes of the fifth lumbar vertebra were smaller than those of the fourth, and also 2.4 per cent of lumbarizations or sacralizations were found.

It is demonstrated from case histories that the symptomatology attributed so often to sacralization, enlargement of the fifth lumbar transverse processes, etc., is even more frequently encountered in especially small fifth lumbar transverse processes. The disease entity postulated for sacralization, therefore, must be denied, and radical surgical procedures as advocated and practised, especially in France, are to be replaced by conservative methods.

Hans A. Jarre, M.D.

SYPHILIS

Gastric Syphilis. K. J. Yeo. British Jour. Radiol., October, 1931, IV, 510-512.

Serial roentgenologic observations were made of a married women, 21 years of age, who for six months had suffered from gnawing epigastric pain, worse immediately after eating, of rather continuous character, associated with a considerable weight loss. On first roentgenologic examination nothing other than a mild hour-glass type of spasm in the pyloric region was noted. Weight loss continued. A year later a second X-ray observation was made, at which time extreme narrowing, with some shortening of the lower part of the stomach, was observed. The affected area was 5 centimeters long, the diameter of the lumen varying from less than 1 to less than 3 centimeters. The narrowed part appeared rigid and showed no peristalsis. The pylorus was continuously open with resultant rapid emptying. Wassermann

and Kahn tests were strongly positive; a fractional gastric analysis showed complete achlorhydia.

Under anti-syphilitic treatment the symptoms rapidly disappeared and the normal weight was quickly regained. X-ray studies during treatment and after completion of it showed slight but definite changes in the form of a widening of the affected portion of the gastric lumen.

J. E. HABBE, M.D.

Considerations on Two Hundred Cases of Congenital Syphilis. T. Valledor. Boletín de la Sociedad Cubana de Pediatría, June, 1931, III, 221-230.

The author introduces here a good outline on the subject. He states that specific osteochondritis and periostitis occur in about 5 per cent of the cases, as shown by X-rays of this series. According to him, the most common symptoms are splenomegaly, hepatomegaly, mucopurulent coryza, cutaneous syphilides, painful insomnia, testicular tumefaction, digestive disturbances, *et cetera.*

N. G. GONZALEZ, M.D.

The Diagnosis of Syphilitic Aortic Insufficiency and Its Difficulties According to Statistics of Eighty-four Cases of Solitary Aortic Insufficiency of Adults, with Autopsy. (Radioscopic Examination, Pt. XIV, 573-577.) L. Gallavardin and L. Gravier. Jour. Méd. de Lyon, Oct. 5, 1931, XII, 567-583.

The authors enter into an exhaustive and impartial discussion of the results obtained by radioscopic examination of the aorta during the course of aortic insufficiency, a subject fraught with difficulties. They point out that although in some cases the evidence of syphilitic aortitis is well demonstrated, it may, in others, be entirely absent, aortic insufficiency in itself being capable of imprinting on the aorta important changes which may in no way be associated with syphilis. The subject is divided into the following:

(a) Aortic insufficiencies with radiologic findings, diagnostic of syphilitic aortitis, such as a sacciform aneurysm of the aortic arch, or those cases of large dilations of the vessel reaching or even exceeding 5 centimeters. Such dilations cannot be due to senile changes nor to atheroma; they are to be regarded as true stigmas of aortic syphilis.

(b) Syphilitic aortic insufficiencies without radiologic signs of syphilitic aortitis. These are numerous, especially in patients relatively young, from 45 to 50 years of age, in whom the aortic diameter is scarcely 2 or 3 mm. in excess of the normal at that age.

(c) Endocardial aortic insufficiencies which, from the very existence of insufficiency, are accompanied by important modifications of the aortic shadow. Even in young patients, the differential pressure rises as the aortic regurgitation and the left ventricular hypertrophy increase, causing the aorta to enlarge frequently from 2 to 4 mm. beyond its normal diameter, according to the patient's age. It is more especially at ages over 55 years that radioscopy discloses frequent notable changes of the aortic shadow, these changes involving particularly the caliber and opacity of the aorta; however, the authors have never seen the aorta reach 5 centimeters.

(d) Radioscopy in aortic insufficiencies of doubtful etiology, whether syphilitic or endocardial. Here the authors discuss at length the diagnostic value of accentuation of the curves of the arch, the aortic caliber, and the exaggeration of aortic opacity, this last sign being considered by some as the most significant of syphilitic aortitis.

The authors conclude that radiology fails to yield all the assistance to the subject which could apparently have been expected by those who believe that alterations in the aortic walls are always indicative of syphilitic aortic insufficiencies. It has demonstrated that the same condition may be found, although less frequently, in endocardial aortic insufficiencies of older patients. But even though radioscopy often fails to solve the etiologic problem of a diastolic aortic murmur, its importance should not be underestimated. In a few cases, at least, it demonstrates the syphilitic nature of vascular specific aortitis. Besides, in a large percentage of cases, radioscopy furnishes useful information which, although not having in itself an absolute value, is of very material clinical assistance.

HENRY BAYON, M.D.

THE THYMUS (DIAGNOSIS)

Congenital Enlargement of the Thymus Gland: Report of Case. Henry E. Stafford. Arch. Pediatrics, June, 1931, XLVIII, 386-389.

A case is reported of a newborn infant whose chief symptoms were dyspnea, cyanosis, and mucus in the throat. Particularly on account of the improvement which followed radiation therapy, the author was quite convinced that he was dealing with an enlarged thymus.

E. C. VOGT, M.D.

Diagnosis and Treatment of Thymoma. L. F. Craver. Med. Clin. N. America, September, 1930, XIV, 507-525. (Reprinted from "Cancer Review" by permission.)

In this excellent paper the author limits his discussion to the clinical diagnosis and irradiation treatment of thymic tumors, and illustrates most of his

points from a single case report. He believes that in most cases the diagnosis of thymoma can be made with considerable certainty from the clinical findings alone, while in some this may be impossible, even on necropsy and histologic examination. . . .

At necropsy on a woman, who had shown all the clinical signs of severe myasthenia, the anterior mediastinum was found to contain a hard tumor corresponding histologically to Schmincke's lymphoepithelial tumor. Apparently it was benign, no metastases being found. Histologic examination of the musculature of the diaphragm, tongue, throat, esophagus, and abdominal wall showed degenerative changes in the muscles themselves, reactive and chronic inflammatory changes in the perimuscular and perivascular connective tissue, and, in places, dense round-cell infiltration (Buzzard's lymphorrhagia). Possibly these changes were due to a toxic agent produced by the thymus.

F. Cavers, D.Sc.

THE THYROID (THERAPY)

Concerning the Question of the Treatment Method of Toxic Goiter. E. Hayer. Strahlentherapie, Oct. 24, 1931, XLII, 414-424.

The fundamental difference between surgical and radiologic treatment of toxic goiter is outlined. While the operation seeks to remove in one sitting as much of the thyroid tissue as can be safely done without producing myxedema, irradiation causes a slow regression of the functioning cells. It seems that from 40 to 60 r are sufficient to reduce the secretion. The author has grouped his seventy-six cases of irradiated thyrotoxicosis according to the basal metabolic rate.

The first group consists of cases with +70 or more, the second group with from +40 to 70, and the last group +40 or less. In the first group there were twenty-four patients, nine of whom were cured, nine considerably improved, four not improved, and two died. The respective figures for thirty-five cases belonging to the second group are eleven, twenty, three, and one, and for the third group of seventeen cases they are four, eight, four, and one.

An analysis of the statistics shows that the most severe cases responded well, while those of simple hyperfunction received the least benefit from irradiation. It is necessary to select the proper cases for radiation therapy; for instance, large nodular struma should be treated surgically. Very often there are other glands of internal secretion involved. In such cases the author has seen good results from an additional exposure of the hypophysis. He concludes that at present no final decision can be made as to the efficacy of X-ray therapy in toxic goiter.

Ernst A. Pohle, M.D., Ph.D.

Concerning the Radiation Treatment of Thyrotoxicosis. Robert Gantenberg. Strahlentherapie, Oct. 24, 1931, XLII, 401-413.

The author first discusses the literature concerning radiation therapy of Basedow's disease and then presents a tabulation of the statistics published so far. In his own clinic he observed ninety-three cases which were subjected to radiation therapy. Fields of 6×8, 8×10, and 10×10 sq. cm. were used at 30 cm. F.S.D., 180 K.V., 3 ma., 0.5 Cu + 1 Al. The left and right lobe of the thyroid received from 20 to 30 per cent H.E.D.; very often from 10 to 20 per cent were applied as a single dose in acute and severe cases. The thymus area was exposed with 30 per cent H.E.D. Intervals of from two to three days were observed between the exposures. The total dose of an entire series amounted to from 70 to 90 per cent H.E.D. Then followed an interval of from four to eight weeks before another series was started. The effect of the radiation was controlled by basal metabolic rate determinations; if it had dropped to from 20 to 25 per cent, treatment was usually discontinued.

The author differentiates the true Basedow's disease with all the classical symptoms from the so-called "hyperthyroid complex," in which the signs are hyperfunction with struma but without exophthalmos. The rôle of the basal metabolic rate in determining the improvement is analyzed in detail. It is also important to follow the subjective symptoms as, for instance, excessive perspiration, tachycardia, tremor, and gastro-intestinal disturbances. The end-results are compiled in a table where cases are divided into those of true Basedow's disease and hyperthyroidism. In each group the patients are arranged according to the severity of symptoms. There were sixty-four cases of Basedow's disease; thirty severe, twenty-two moderately severe, and twelve beginning cases. Of the first group, six were cured, seven considerably improved, eleven temporarily improved, and six did not respond. The respective figures for the second group were four, eight, eight, and two, and for the third group, four, two, three, and three. There were twenty-nine cases with hyperthyroidism. Five of these were severe cases; none of those was cured, two were considerably improved, two temporarily improved, one remained unchanged. Of the remaining twenty-four moderate and early cases, nine were cured, three considerably improved, nine temporarily improved, and three remained unchanged.

In conclusion, the author states that about 50 per cent of the cases with hyperfunction were cured or considerably improved, while 20 per cent of the patients with true Basedow's disease were completely cured. He feels that radiation therapy in toxic goiter may be given a trial unless there are definite indications for immediate operation. Cases which do not show any improvement after three or four

(but not exceeding six) months should be operated on. The same holds true of patients with acute symptoms. In the remaining cases of toxic goiter, radiation therapy combined with medical treatment is the method of choice.

ERNST A. POHLE, M.D., Ph.D.

THE TONSILS

Tonsillectomy Following Irradiation in Lymphosarcoma of the Tonsils. A Successful Case without Recidivation for Six Years. D. G. W. Van Voorthuysen. Geneeskundig Tijdschr. voor Nederlandsch-Indie, Dec. 1, 1931, LXXI, 1425-1427.

Malignant tumors of the tonsils show, according to their nature, varying prognoses. Lymphosarcomas seem to offer the greatest hope, as they are very responsive to irradiation, and at times disappear with astonishing rapidity, although recidivation after a longer or shorter period generally serves to destroy the early satisfaction in the apparent recovery. With the improvement in roentgen technic and the employment of radium better results have undoubtedly been obtained, although recidivation is still very frequent.

The author reports a case of lymphosarcoma of the tonsils, in which biopsy was indecisive, with regional metastases of the lymphatic glands of the lower jaw and neck, as shown by extirpation. The sarcoma finally disappeared, following roentgen irradiation. There was speedy recidivation, but the sarcoma again disappeared following renewed irradiation, and after tonsillectomy failed to reappear. There was no further recidivation for six years, down to the time of the patient's death, which was from other causes.

W. W. WHITELOCK, Ph.D.

TUBERCULOSIS (DIAGNOSIS)

Diagnosis and Treatment of Tuberculosis of the Small and Large Intestine. Lawrason Brown and Homer L. Sampson. Jour. Am. Med. Assn., Jan. 2, 1932, XCVIII, 26, 27.

Intestinal tuberculosis may be primary or secondary, the former being largely of surgical interest, while the latter is almost always associated with pulmonary tuberculosis and constitutes its most frequent amplification. Of 1,801 consecutive patients at the Trudeau Sanatorium, 8 per cent had definite intestinal tuberculosis.

The roentgen method of diagnosis reveals only the presence of intestinal ulceration, but, when associated with pulmonary tuberculosis, especially if the pulmonary disease is at all advanced, it is safe to make a diagnosis of intestinal tuberculosis. Roentgen technic may not reveal the whole extent of the involvement.

Suggestive symptoms of beginning intestinal tuberculosis include, among others, any digestive disturbances, marked constipation, failure of the pulmonary condition to improve, an irregular temperature with subnormal fluctuations, possibly a decrease of pulmonary symptoms (while the patient is no better), alternating diarrhea and constipation, and marked nervousness.

Symptoms are often absent and abdominal and proctoscopic examinations are often negative. One must, therefore, turn to a study of the barium meal at the seventh, eighth, ninth, and tenth hours, and again at the twenty-fourth hour. The barium enema usually confirms the fact that the ulcerated cecum or other portions of the colon may fail to receive or to retain the barium.

C. G. SUTHERLAND, M.D.

The Diagnosis of Co-existing Emphysema and Pulmonary Tuberculosis. W. C. Nalty. Med. Bull. Veterans' Administration, January, 1932, VIII, 50-52.

Emphysema, a dilatation of the alveoli of the lungs, characterized by a change in the shape of the chest and by changes in the breath sounds, may be the result of whooping cough, asthma, bronchitis, or tuberculosis. It is considered difficult to attempt the diagnosis of tuberculosis upon the history and physical examination alone in a patient having emphysema, either with or without a co-existing asthma or bronchitis, because the findings of the latter conditions overshadow the usual findings of pulmonary tuberculosis.

The history of cough and expectoration is of little value, as these symptoms are common to tuberculosis, asthma, and bronchitis. On inspection an emphysematous chest may be mistaken for an exceedingly well-developed chest. Palpation may reveal negative findings, and, on percussion, a hyperresonance, rather than the usual dullness, may be elicited. On auscultation the usual breath sound changes of emphysema overshadow the findings of tuberculosis. The associated bronchitis or asthma may likewise hide the usual signs of pulmonary tuberculosis. A sputum positive for tubercle bacilli will prove the association of tuberculosis and asthma. However, pulmonary tuberculosis should not be eliminated because a negative sputum is obtained. The author is of the opinion that in many of these cases X-ray examination is usually the only means of establishing a diagnosis of pulmonary tuberculosis. In those cases in which the diagnosis has been made by other means, X-ray examination offers the only method of establishing the amount

of lung tissue involved. The author reports several cases of emphysema associated with tuberculosis, which illustrate the difficulty of the differential diagnosis of these conditions.

J. N. Ané, M.D.

The Epitheloid-cellular Type of Lung Tuberculosis (Sarcoid). Held. Röntgenpraxis, Oct. 15, 1931, III, 927-932.

The author describes three atypical cases of tuberculosis of the lungs which correspond to the so-called sarcoid. Their appearance is much like the disseminated type of Hodgkin's disease of the lungs. All of them began with an erythema nodosum. Histologic examination in one case confirmed the diagnosis of tuberculosis. Tubercle bacilli could not be demonstrated in the sputum. The spread of the infection probably takes place by way of the blood stream from diseased hilum glands. Enlargement of the hilum glands seems to be a more or less constant finding in roentgenograms of patients with this disease. Why it does not lead to an acute miliary tuberculosis can be explained only by the immune state of the patient. The localization of the foci in the interstitial tissue of the lungs is probably explainable by this positive anergy.

H. W. Hefke, M.D.

Tuberculosis of the Jejunum. Franklin W. White and I. R. Jankelson. Jour. Am. Med. Assn., Jan. 2, 1932, XCVIII, 23-26.

At autopsy there are signs of tuberculosis of the bowels in approximately 50 per cent of those who die of pulmonary tuberculosis. Intestinal involvement may occur at any stage of the pulmonary infection, being more common in the advanced and active cases. Multiple lesions are the rule, the most common location being the lower ileum and ileo-cecal region. The jejunum is frequently involved in the terminal stage of an extensive tuberculosis of the bowels. It is rare to find isolated tuberculosis of the jejunum without tuberculosis elsewhere in the bowel. Symptoms of intestinal tuberculosis may be absent or very vague. The present-day roentgen technic does not readily visualize the jejunum. Tuberculosis of the jejunum is one of the most frequent causes of jejunal stenosis.

Two cases are reviewed and discussion of the pathology, symptoms, and diagnosis follows. The technic of the roentgen examination includes the "scout" film, valuable only when the bowel is distended above the lesion, and frequent observations in the first six hours after the barium meal, since evidence of partial obstruction is apt to be transitory.

C. G. Sutherland, M.D.

Roentgenologic Diagnosis of Pulmonary Tuberculosis. Walter R. Wynne. Med. Bull. Veterans' Administration, December, 1931, VII, 1153-1159.

The author discusses the important factors in the roentgenologic diagnosis of pulmonary tuberculosis. Proper technic, with attention to all details, is considered of the utmost importance. A competent roentgenologist should supervise all roentgenographic examinations in the department and this should never be left to the judgment of the technician.

Contrast, detail, and density, in proper relation, are necessary to make a good roentgenogram, and when any one of these is left out, there results a film that should not be interpreted. Contrast is controlled chiefly by the amount of X-ray energy applied to the films, and detail by the size of the focal spot of the tube and also by the film focal spot distance. The author believes that stereoroentgenograms, made with the patient standing, offer more valuable assistance in the routine case than those taken in other positions. The author also emphasizes the importance of a careful dark room technic.

In the interpretation of chest films the stereoroentgenograms should be studied only in the position in which they were taken. The quality of the films should always be noted, and if found unsatisfactory the examination should be repeated. The size and shape of the chest should next be studied. The position of the trachea, and the size, shape, and position of the blood vessels and heart should then be observed. Special notes are made of normal or abnormal markings of each dome of the diaphragm and of both costophrenic angles.

In studying the lungs the trachea should be traced down to the carina, and the hilum observed for abnormalities. The trunk markings should next receive the attention of the roentgenologist and each trunk should be followed from the hilum to the periphery. In localizing foreign bodies in the right lung it is well to remember that the pulmonary artery enters the lung below the trunks to the upper lobe and above those to the middle and lower lobes. In the normal lung the structures just under the pleural surface cannot be seen.

In pulmonary tuberculosis we see a fight staged for the establishment of the tubercle bacilli on the one hand and a defensive reaction on the other to repel the invasion. Once the exudation has started in a primary lobule, it immediately involves all the others making up one of the secondary lobules, but this reaction does not extend through the septa until ulceration takes place. In adult apical pulmonary tuberculosis there occurs an involvement of many secondary lobules near the pleural surface in the upper part of the lung. At this time, no other known pathologic conditions can produce such changes. A few other conditions, such as influenza and septic pneumonitis, may involve the secondary lobules in the upper portion of the lung and just

under the pleural surface, but in these other conditions the involvement is all in one stage and not in crops, as seen in tuberculosis. The puerile and basal involvement of pulmonary tuberculosis cannot always be distinguished from other diseases. Other pulmonary diseases, likewise, may produce enlargement and calcification of the glands and thus closely simulate the glandular form of pulmonary tuberculosis, this form, however, showing evidences of caseous changes as well as calcification.

Dunham believes that miliary tuberculosis is always the result of reinfection of an old focus. This form of pulmonary disease is believed to be the result of a lack or loss of immunity. Many cases of healed miliary tuberculosis are being found in X-ray laboratories with modern technic and interpretation. The appearance is that of a fine, sharp, discrete studding, more or less evenly distributed throughout all the lobes. In the more recent cases distribution is similar, but instead of studding, there is a fine mottling which has not reached the definitely calcareous stage.

J. N. Ané, M.D.

The Present Conception of Pulmonary Tuberculosis. W. Jost. Schweiz. med. Wchnschr., Aug. 22, 1931, LXI, 789-792.

The author first questions which teaching one should believe: the old, which conceived the apical involvement to be primary with gradual extension, or the new, which conceives the origin to be acute, affecting any portion of the lung, with extension in acute stages. The fact that the "früh-infilträt" has, comparatively, only recently achieved much attention, despite the fact that roentgenographic technic has changed little, argues for an increasing incidence of the acute type.

Since the acute "früh-infilträt" is variable in location, gives few clinical signs, and may be found in an individual who appears to be healthy, X-ray examination is extremely important. It is far better to make too many radiographs than too few.

H. C. Ochsner, M.D.

Primitive Tuberculosis of the Spleen. Pathogenetic and Clinical Notes. Enrico Greppi. Riv. d. Patol. e Clin. d. Tuberc., Dec. 31, 1931, V, 1025-1036.

Is diagnosis, or at least a diagnostic suspicion founded on a concrete basis, possible in the living subject in this obscure disease on which pathologic and clinical text-books have so little to say that is of a definite and helpful nature?

The author believes himself justified in replying affirmatively to the above question, at least as regards cases not entirely obscure in etiology or rendered deceptive by a completely misleading aspect, both on the basis of a study of the literature and of a personal case in which the definite diagnosis of "primitive tuberculous splenomegalia" was later confirmed by anatomic investigation.

The present-day methods of investigations, although they have not overcome the inherent difficulties of diagnosis in the more obscure cases, show distinct advance over those of an earlier date and permit recognition of primitive tuberculous foci and signs of latent activity of the disease. In addition, direct radiographic examination of the splenic tumor has been suggested for possible demonstration of calcified nodules attributable to the specific process. In this connection, however, the siderotic-calcareous nodules of the Gamna type must be borne in mind as a possible cause of the shadow. In any event, radiologic investigation serves as an adjuvant to disclose the connections of the organ with adjacent viscera, and also, naturally, the presence of other plastic and calcified masses.

W. W. Whitelock, Ph.D.

Forms of Pulmonary Tuberculosis in Early Infancy. Edgar Filgueiras. Archivos de Pediatría, Rio de Janeiro, January, 1931. Reprinted in Boletín de la Sociedad Cubana de Pediatría, June, 1931, III, 233-236.

The purpose of this paper is to call the attention of physicians to the frequency of pulmonary tuberculosis in infancy and the necessity of an early diagnosis and proper treatment.

To the author, the most important symptoms are: Failure to gain weight or loss of weight; restlessness; loss of appetite; afternoon fever; cough, and digestive disturbances. He states that the X-ray always either confirms or makes the diagnosis.

N. G. Gonzalez, M.D.

Silicosis and Pulmonary Tuberculosis. J. C. Herrick. Med. Bull. Veterans' Administration, November, 1931, VII, 1063, 1064.

It is generally believed that silica dust is the most injurious of all the various materials which produce pneumonoconiosis. Particles of silica carried into the lung tissues dissolve slowly, react chemically upon the cells containing them, and cause cell death. The dead cells collect and block up the lymph chan-

nels and glands. The necrotic tissue so caused forms a lodging place in which the tubercle bacilli grow. In those cases uncomplicated by tuberculosis the final result is the formation of fibrous tissue, which in time replaces the normal alveolar structure of the lungs.

Of importance is the fact that, once the silica dust has gained access to the lungs, the silicotic process continues to advance, even after complete withdrawal from exposure. A tuberculous infection in a lung containing silica particles runs an unusually rapid and fatal course. Silicosis, uncomplicated by tuberculosis, may also terminate fatally.

The author reports two cases of miners, with sputa positive for tubercle bacilli, in which evidences of silicosis were found by clinical and roentgenologic examinations. Both cases terminated fatally after severe pulmonary hemorrhages. An autopsy was performed in one case.

J. N. Ané, M.D.

The Onset of Pulmonary Tuberculosis in the Adult. Radiologic Part. Luigi Turano. Il Giornale di Tisiologia, Nov. 30, 1931, X, 303-318.

The author discusses the value of radiology in determining the existence of incipient pulmonary tuberculosis, but points out the necessity of constant collaboration of radiologist and clinician. Without anatomic-pathologic control, it is impossible to judge accurately as regards the significance of certain radiologic findings. With this reservation, he formulates the following conclusions.

Radiologic investigation, especially in the form of radiographs, is absolutely indispensable in determining the existence of incipient tuberculosis in the adult. Examinations should be made at varying intervals, always employing the same technic.

Even when the clinical examination is absolutely negative, radiologic investigation may reveal important alterations, such as Assmann's infiltration, which, although it may occur in any part of the lung, shows preference for the subclavical region. In no case, however, can it determine whether this infiltration is actually the primary tuberculous lesion in the adult, or merely represents a halting place of apical foci, whether visible or not by roentgen rays; this question can be settled only at autopsy. The radiologic discovery of the infiltration is highly important as regards the early start of treatment, because its presence generally indicates the establishment of a tuberculous process.

The diversity of the statistics regarding the infiltration of Assmann and apical tuberculosis is to be attributed not alone to the nature of the material used (from dispensary or sanatorium), but also mainly to the lack of a suitable standardized radiographic technic of the thorax. The following technic is, therefore, suggested: In addition to the radioscope, a previous radiograph or rapid exposure at the distance of 1.5 meter, during the pause after inspiration; then two radiographs of the apical region, one with the technical note of Albers-Schönberg and the other with inverted incidence of the caudal side.

Radiographic examination, even the most exact, if negative, cannot exclude the existence of an apical lesion.

The statement based on radiologic findings that tuberculosis of apical origin is always less virulent, in contrast to the conception that general phthisis originates in extra-apical regions, does not as yet appear to have been demonstrated. On the contrary, Aschoff's observation that every reinfection starts with the anatomic-pathologic characteristics of an early infiltration, in whatever part of the lung, deprives the discussion of all value. On the other hand, numerous radiologic findings in genuine progressive phthisis of apical origin seems to show that this hypothesis lacks a secure basis.

The discovery of old foci in the apex is equally important, as it has been fully demonstrated that from reactivating of the same there may result genuine phthisis. Not alone the reinfection of Puhl, but also the calcified foci of Simon must be regarded as old foci. The presence of a circumscribed or of a diffused shadow should always serve to direct attention to the various possible causes of error.

The hypothesis of reinfection in the adult, with ileal origin and ascending extension, first, toward the subclavical region and then into the apex, has been demonstrated neither by anatomic-pathologic means nor radiologically, and, according to the author, rests upon an error of interpretation.

The radiologic manifestations indicating the onset of pulmonary phthisis in the adult become less frequent according as they start more posteriorly.

W. W. Whitelock, Ph.D.

Acute Miliary Pulmonary Tuberculosis. W. E. Hamlin. Med. Bull. Veterans' Administration, October, 1931, VII, 973, 974.

The author reports the case of a male, 35 years of age, who was admitted with a diagnosis of moderately advanced chronic pulmonary tuberculosis. Roentgenologic examination showed evidence of an old healed tuberculous process at the left apex, but no evidence of active tuberculosis in either lung. Seven months later the patient was discharged as absent without leave. During his stay in the hospital he gained twenty-nine pounds.

One year subsequent to his desertion he was readmitted. He had lost thirty-three pounds during the one-year period and at the time of admission he appeared ill, with a yellowish tinge to the skin.

Blood examination revealed a marked anemia; bronchovesicular breathing and increased whispered voice above the second rib on the right was noted on physical examination. Roentgen examination showed evidence of tuberculosis in both upper lobes.

After one month of hospitalization the patient's temperature began to rise, and the pulse rate increased. X-ray examination at this time revealed evidence of numerous small discrete shadows of miliary size and type throughout both lung fields. The patient lived for three months after the diagnosis of acute miliary tuberculosis was made.

J. N. Ané, M.D.

A Case of Generalized Tuberculosis of the Lymph Nodes Accompanied by Appendicitis and Cholecystitis. Enrico Dotti. Riv. di radiol. e fisica med., December, 1931, IV, 200-205.

A woman, 22 years of age, came to the hospital complaining of pain in the right abdomen. X-ray examination showed cholecystitis, without stone, and appendicitis.

Examination brought out the fact that the patient also had tuberculosis of the cervical, axillary, inguinal, thoracic, and abdominal nodes. At operation the diagnosis of cholecystitis and appendicitis was confirmed. The nodes in the abdomen were enlarged and some were calcified, others being caseated. The patient made a good recovery and is clinically well.

Another interesting point brought out by this case is that notwithstanding the enormous destruction of lymphopoietic tissue, the differential leukocyte count was normal.

E. T. Leddy, M.D.

The Subapical Form of Incipient Pulmonary Phthisis. G. F. Bume. National Med. Jour. China, December, 1931, XVII, 687-700.

In 1922, Assmann published his observations on infraclavicular tuberculous infiltrations and in 1926, Redeker, who previously had devoted his studies exclusively to tuberculosis in childhood, approved the conclusions of Assmann. However, before this time Wessler and Jaches, as a result of roentgen-ray studies, concluded that the earliest evidences of pulmonary tuberculosis were found far more frequently in the infraclavicular region than in the apex of the lung. Assmann defined these infiltrations as "well circumscribed, round shadows of homogeneous character whose borders contrast distinctly, but without sharp outlines from their surroundings. The size varies from that of a ten-cent piece to that of a one-dollar piece." The first cases were composed of students, young doctors, and young nurses, whose duties offered opportunities for reinfection. Their complaint was a slight general malaise. Physical examination revealed negative results, but on roentgen-ray examination, Assmann discovered the subapical foci for the first time.

While the existence and the frequent occurrence of infraclavicular infiltrations are now fairly beyond dispute, opinions regarding their origin still differ. Assmann believed in a secondary, exogenous, respiratory reinfection but did not deny the possibility of occasional hematogenous reinfection. Romberg and Lydtin explained the subclavicular infiltration as a perifocal reaction, either around an infected bronchial or tracheal gland, or around a parenchymatous reinfection focus in adults. According to Loeschcke, it begins as an exudative, bronchopneumonic affection by metastatic formation from an earlier, proliferative apical lesion. As an exudative tuberculous lesion, it may be entirely absorbed and heal without leaving any vestiges. It may, on the other hand, undergo fibrous transformation, encapsulation, and calcification, or it may lead to caseation and excavation, spreading into the neighboring parts of the lung.

Three groups may be distinguished in regard to clinical findings. The first division includes those young individuals who are exposed in their work, and who complain of malaise, subfebrile temperature, night sweats, and loss of weight. A second group of cases is described as developing symptoms of influenza, with acute onset of high fever. A third class of patients experiences acute and more or less profuse hemoptysis. The past histories fail to reveal any symptoms suspicious of pulmonary tuberculosis. On physical examination of the patients of these groups, no, or very little, evidence of pulmonary disease is found. Roentgen-ray examination is generally believed to be the classical method of demonstrating these subapical lesions.

Regarding the prognosis of subclavicular pneumonic lesions, it has been definitely proven that they may disappear completely, as other pneumonic infiltrations do. However, the author agrees with most writers that, without therapeutic measures, progressive phthisis is the most frequent sequel.

In the author's opinion all exposed persons, members of tuberculous families, students living with persons suffering from active tuberculosis, and those stricken with influenza in which the symptoms of pneumonia are absent, should be periodically subjected to roentgen-ray examination in order to demonstrate freshly infected cases as early as possible.

J. N. Ané, M.D.

Pulmonary Tuberculous Sclerosis. Achille Sega. Riv. d. Patol. e Clin. d. Tuberc., Dec. 31, 1931, V, 1058-1070.

From the clinical point of view, we must allocate to the sclerosis group those forms of pulmonary

tuberculosis in which the anatomic substratum of the connective elements is sufficiently extended and marked to constitute the predominant, if not the unique, factor of the clinical symptomatology and of the anatomic-pathologic picture of the type of pulmonary tuberculosis in question.

It is indispensable for the diagnosis of this particular type of pulmonary tuberculosis to point out briefly the most important and most characteristic radiologic findings. First in line must be mentioned alterations as regards shape of the skeleton, such as asymmetry, costal retractions, deviations of the vertebral column, even of very low grade, when the physico-semeiology is but faintly apparent and radiologic examination proves a most valuable recourse.

The ordinary findings as regards the respiratory apparatus consist primarily of modifications in the normal transparency of the pulmonary fields in the form of more or less marked and extended opacity corresponding to the sclerotic zones. In some cases it is impossible in the involved hemithorax to recognize the pulmonary outline save for brief moments. At times the more or less dense shadows appear in linear form, running in the direction of the interlobular fissures. There may be immobility and opacity of the costal diaphragmatic sinuses, upward stretching of the diaphragm, or pericardic-diaphragmatic adhesion, sometimes in the form of pinnacles.

The pulmonary field opposed to the sclerotic field may preserve its normal transparency, or even appear emphasized in cases of vicarious emphysema; or opaque zones due to pleuritic or parenchymatic processes of various types and extension may be observed.

In addition to the ordinary radiologic picture pointed out above, there are certain indirect signs equally characteristic, which have been the object of special study by Italian authors (Pescatori, Casati, etc.). Among these the following are worthy of special mention: Deformity and displacement of the pulmonary hila and of the interlobular fissures; the phenomenon of Rist and de Abreau, or the movement of hemithoracic balance; the phenomenon of Kienböck; the phenomenon of the mediastinal pendulum of Holzknecht and Jacobson; dislocation of the shadows of the heart and large vessels, and deviation of the images of the trachea and esophagus.

As regards deformations and displacements of the pulmonary hilus and of the interlobular fissures, certain French authors speak of the elevation of the pulmonary hilus in cases of bilateral retraction of the lungs; when, on the other hand, the lesion is unilateral at the height of the corresponding hilus we have, in addition, lack of visibility of the latter through attraction of the mediastinum, whereas the hilus on the opposite side becomes free.

The altered interlobular fissures may suffer important displacement by a kind of balance movement, so that they appear oblique from within outward and from below upward. In roentgenograms in anterior-posterior as well as lateral projection, a peculiar fan-like arrangement of the pleural fissures may be observed, upwards or downwards according to the seat of the process of pulmonary retraction. The displacements upward often cause the hilus shadow to rise to the height of the aortic arch, while in the downward displacements the hilus shadow often remains covered by that of the heart.

There is stretching of the hilus also in cases of sclerosis and retraction of the interlobular pleura.

The phenomenon described by Rist and de Abreau consists of the dissociation of the movements of the anterior and posterior region of the diaphragm. or the hemithoracic balance movement determined by sclerosis partly localized in the anterior region of the lung. This phenomenon may be observed by placing the patient in profile, when it is seen that the posterior half of the diaphragm falls normally during inspiration, while the anterior half rises slightly.

In cases of displacement of the heart and large vessels toward the left, the right outline of the heart either does not appear at all, merges with the shadow of the vertebral bodies, or is found on the left among these bodies. The study of the orientation of the heart and large vessels is made in a more exact manner by means of orthodiagraphy in various projections, or, even better, by the method of plastic reconstruction of the heart as suggested by Palmieri. In this manner, a rotation of the heart on its great axis may be stabilized, so that the point of the left ventricle is carried from the left toward the right and from the rear toward the front. The aorta and the vena cava are displaced toward the right and rear, while the pulmonary cone approaches more closely to the anterior thoracic wall, moving toward the right.

In one case of partial retraction observed by the author, the sclerotic process, limited to the right lobe, revealed under radiologic examination dense opacity of the upper portion of the pulmonary field, limited by the interlobular field. The mediastinal shadow appeared displaced toward the right in its upper portion (trachea and great vessels), while the heart was in its normal place.

W. W. WHITELOCK, Ph.D.

Tuberculosis of the Tracheobronchial Glands. Joseph C. Savage. Calif. and West. Med., July, 1931, XXXV, 32-34.

The proper diagnosis of tracheobronchial glands is of the greatest importance to the infected child, for hilum tuberculosis not adequately treated may

become active and be a menace to other children. Whereas Stoloff considers only the roentgenologic examination and the tuberculin reaction to be of value in diagnosis of this condition, the author believes the history of contact with a tuberculous patient of great importance. Roentgenograms must be properly taken, in postero-anterior and straight lateral positions, and a proper interpretation must be made of these.

The National Tuberculosis Association has expressed itself as follows: "Interpretation of films should be made by an experienced physician who is familiar not only with chest films in general, but with films of children's lungs in particular. He should also have a clinical background, and the interpretation should not be independent of careful consideration of history, symptoms, and physical examination."

We have no clear understanding of what is a perfectly normal chest, because different men vary in their opinions as to the importance of the same shadows; therefore interpretation of the X-ray findings should go hand in hand with the history, the clinical, physical, and laboratory data. Most of the hilar shadows are made up of the larger vessels and not the bronchi. Normal lymph glands do not cast a shadow and cannot be recognized unless they contain calcium or encroach on pulmonary fields.

The author also discusses the clinical signs and symptoms of this condition, among which are mild disturbance of nutrition, fatigue, irritability, and a slight daily rise in temperature.

FRANCIS B. SHELDON, M.D.

TUBERCULOSIS (THERAPY)

Arrested Pulmonary Tuberculosis. Louis H. Fales. Med. Bull. Veterans' Administration, December, 1931, VII, 1121-1127.

The author considers the present classification of the American Sanatorium Association unsatisfactory in determining the existence of arrest in pulmonary tuberculosis. Considerable progress has been made since the last modification of this classification was adopted, in 1922, and suggestions of criteria of arrest are offered.

Bruns made an exhaustive study and spent considerable time in experimental work on cadavers, coming to the conclusion that râles of the most usual type heard in pulmonary tuberculosis—which occur in showers during inspiration following an expiratory cough—do not mean active tuberculosis or even tuberculosis at all. They are not due to moisture and are more of the nature of atelectatic râles. Heise, of Saranac, studied the records of 412 cases over a six-month period and demonstrated that the increase or diminution of râles in pulmonary tuberculosis was of no value in determining the patient's progress. It is, therefore, believed that râles are of no value in determining progression and retrogression of a tuberculous lesion and that they have no place in a scheme of classification.

Latent pulmonary tuberculosis is relatively common in children and also occurs in adults. A parenchymal infiltration as seen on the roentgenogram is often the only evidence that these patients are ill. In these cases, as in those of children, if proper treatment is not instituted, the lesion usually progresses and in months or years the late manifestations will develop. Likewise, it was formerly believed that pulmonary tuberculosis could be arrested in a few months but the roentgen ray has demonstrated that, although clinical symptoms may disappear in a few months, the tuberculous lung pathology clears and fibroses very slowly, healing only after years of prolonged and continuous rest. Amberson emphasized the importance of serial roentgenograms in order to determine the progression or retrogression of the pulmonary lesions. Gerald B. Webb and McPhedran also consider the roentgen ray of utmost value, not only in diagnosis but also in determining the exact changes occurring in the lungs during treatment. The author is of the opinion that bacilli in the sputum and all constitutional symptoms that are reasonably certain to be due to tuberculosis should be absent for at least one year before the case in considered arrested. Even then, serial roentgenograms should be the deciding factor before final conclusions are reached. The roentgen-ray criteria for a healed lesion should consist of the following: (1) A stable or stationary lesion; (2) a hard, well-fibrosed lesion; (3) a lesion which has remained stationary for months; (4) the above points should be determined by a competent roentgenologist using a proper technic and satisfactory roentgen-ray equipment.

Clinical studies have stressed the importance of complete rest and care in the inauguration of graduated exercise. After the lesion has remained hard, fibrosed, and stationary for six months, as demonstrated by serial roentgenograms, and an additional six months have elapsed with carefully graduated exercise and observation without reactivation of the disease, the case may be considered arrested.

J. N. ANÉ, M.D.

Indications and Results of Aurotherapy in Pulmonary Tuberculosis. V. De Benedetti and Felice Tocco. Riv. d. Patol. e Clin. d. Tuberc., Dec. 31, 1931, V, 1076-1085.

After the early unjustified enthusiasm and the following inevitable distrust of aurotherapy, opinion regarding this form of treatment, as in the case of other curative measures, has been modified until it

now occupies a position between the two extremes, ready to accept results on the basis of practical experience.

In the case of a medication of this kind, which is mainly adapted to the obtaining of partial and symptomatic results—but which are not on that account negligible—a just interpretation of the general effect is difficult, especially in view of the infinite variations presented by the disease.

In the course of five years' employment of the therapy in question, the authors observed no serious accidents. More worthy of attention than the slight temporary disturbances listed are the local reactions with increase of auscultatory indications, pleural manifestations, and, at times, with accentuation of the radiologic shadows, this latter being an outstanding proof of a reaction on the part of the tuberculous granuloma. The importance of these signs in the curative process cannot be disputed.

In fresh and not too extended cases, radiologic *nettoyage* of the secondary disseminations may be obtained. This appears so closely bound up with the aurotherapy as not to permit of doubt regarding the dissolving effects of the latter.

W. W. WHITELOCK, Ph.D.

Results of Roentgenotherapy in Tuberculosis of the Bones and Joints in the Surgical Clinic of the University of Kiel (1918-1927). Annemarie Dormann. Strahlentherapie, 1931, XLII, 201-218.

In this paper the author discusses the results of roentgenotherapy in tuberculosis of the bones and joints, based on a survey conducted in 1929. In the first period, from 1918 to 1921, roentgen rays filtered through from 3 to 4 mm. of Al and a dose of from 10 to 15 X (E.D. = 25 X) were used, in children usually only 5 X as measured with the Sabouraud-Noiré pastille. This dose was repeated at four-week intervals perhaps from six to eight times. In some cases from ten to fifteen treatments were given during the period of from two to three years. Beginning in 1922, the doses were reduced, and from 1924 on, deep therapy, with 0.5 mm. Zn + 1 mm. Al filtration, was employed. The single dose amounted to from 20 to 30 per cent E.D. and was somewhat lower in children. All patients received general treatment as indicated in tuberculosis.

In the compiled tables the patients are arranged according to the site of the lesions. The disease was located in the wrist in twenty-four cases, in seven of which there was abscess formation. Of the remaining seventeen, six healed with full function, three with limited function, four with ankylosis, three died, and one remained unchanged. The respective figures for the seven patients with fistulæ are one, two, one, two, and zero (one patient in this group is not classified). This brings the total number of cured cases to seventeen out of twenty-four.

There were twenty cases in which the ankle was involved; seven of these had fistulæ. Of the thirteen remaining, five healed with full function, one with limited function, two with ankylosis, three died, one grew worse, and one remained unchanged. The respective figures for the seven cases with fistulæ were two, one, two, two, zero, and zero. In this group there were thirteen cases cured out of a total of twenty.

Twenty patients with tuberculosis in the elbow joint were seen, seven of which had fistulæ. Of the remaining thirteen, five healed with full function, one with limited function, two healed with ankylosis, three died, one grew worse, and one remained unchanged. Of the seven patients with fistulæ, the respective figures are two, one, two, two, zero, and zero. This means thirteen cases were cured out of a total of twenty.

Forty-four patients had involvement of the knee joint, eleven of whom had fistulæ. Of the remaining thirty-three, twelve healed with full function, one with limited function, six with ankylosis, two were improved, eight needed operation in addition to X-ray therapy, three died, none grew worse, and one remained unchanged. The respective figures for the eleven cases with fistulæ are two, one, one, zero, one, three, one, and two. This amounts to twenty-three cures out of a total of forty-four cases.

Five patients had the process in the shoulder joint, one of whom had a fistula. Of the remaining four, one healed with full function, one with limited function, one with ankylosis, and one died. The one case with fistula had to be operated on. There are then three cures in a total of five cases.

Seventeen patients had tuberculosis of the hip joint and thirteen of these had fistulæ. Of the remaining four, two were cured and two died. Of the thirteen cases with fistulæ five were cured, three improved, four died, and one grew worse. This means a total of seven cures in seventeen patients.

Tuberculosis of the small bones (metacarpus, metatarsus, calcaneus, and spina ventosa) was seen in forty-six patients, twenty-three of whom had fistulæ. Of the remaining twenty-three, ten healed with complete function, one with limited function, two with ankylosis, six had to be operated on, two died, one grew worse, and one remained unchanged. Of the twenty-three with fistulæ, eighteen healed with full function, two with limited function, one with ankylosis, and two died. In this group thirty-four were cured out of a total of forty-six.

Miscellaneous cases of bone tuberculosis (ribs, sternum, long bones, clavicle) are compiled in a table of twenty-eight. Sixteen of these had fistulæ; of the remaining twelve, eleven were cured and one

died. Of the sixteen cases with fistulæ ten were cured, one died, one had to be operated on, two grew worse, and two remained unchanged. This results in twenty-one cured patients of a total of twenty-eight.

Ten cases of tuberculosis of the pelvis were seen and all had fistulæ; four were cured and six died.

Six cases of tuberculosis of the skull had fistulæ; four were cured, one needed operation, and one grew worse under the treatment.

Of ten cases of spondylitis tuberculosa, eight had fistulæ; of the remaining two, one was healed with motion, and one had a gibbus. Of the eight cases with fistulæ two healed with motion, two with gibbus, two were improved, and two grew worse. There was then a total of five cures out of ten patients.

Multiple tuberculosis was seen in twenty-five patients, twenty of whom had fistulæ; of the remaining five, three were cured with full function, and two grew worse. Of the twenty with fistulæ, four were cured with full function, one with limited function, three were improved, four had to be operated on, seven died, and one grew worse. The end-result was, therefore, eight cures out of a total of twenty-five cases.

A grouping of the patients according to age clearly shows that the benefit derived from roentgenotherapy decreases with the age of the patient. Careful investigations were also undertaken in order to determine the percentage of roentgen late injuries. In only one case, treated in 1919, for tuberculosis of the ankle joint, was there a skin defect which discharged slightly. Pigmentation, bluish discoloration of the treated skin, and telangiectasis were seen occasionally. Disturbance of the growth in children who had been treated was very small, sometimes hardly measurable. Two cases in this group are particularly interesting, brief histories of these patients being given.

The first patient was a boy of 17 years, who underwent treatment, in 1918, because of an involvement of the elbow, the pelvis, the bladder, and inguinal glands. He received a total of 80 X over the ilium and 30 X over the gluteal region. Within nine months' time all fistulæ healed and the patient could resume his work. At the re-examination, in 1929, it was found that all tuberculous processes had remained healed. The patient, who was 29 at that time, showed a definite feminine appearance in the face as well as in the body. The whole picture was very indicative of an injury to the sex glands. This was further supported by the fact that he had been married for four years without having children.

The second patient was a girl, 17 years of age, who was treated, in 1918, because of tuberculosis of the ribs. The diseased area in the region of the right breast received a total of 50 X. Re-examination, November, 1929, showed normal skin in the irradiated field but an infantile right breast. Such a retardation in the development of one breast following irradiation has been described by other clinicians.

In another set of tables, the author's results are compared with those of the Surgical Clinic of the University of Rostock, where the treatment method was very similar. It appears from both statistics that a cure with complete function may be expected in at least one-fourth but not in more than one-half of all cases of tuberculous bones and joints. Late injuries are not very common, and roentgenotherapy of this disease is further recommended as an auxiliary method if applied in doses small enough to almost assure the avoidance of late injuries.

ERNST A. POHLE, M.D., Ph.D.

The Roentgen-ray Treatment of Experimental Tuberculosis. John W. Spies. Am. Jour. Roentgenol. and Rad. Ther., November, 1931, XXVI, 716-725.

Clinical results in the treatment of skin and glandular tuberculosis by roentgen rays have been reported to be good in general, although there have been enough of unsatisfactory results obtained to stimulate laboratory investigation in an effort to further elucidate the problem of this form of radiation therapy of an inflammatory process.

The writer's laboratory material consisted of 115 guinea pigs and eight rabbits injected with varying amounts of a very virulent and a scarcely virulent strain of tubercle bacilli. Sixty-nine of the guinea pigs and four of the rabbits were irradiated according to four different plans; the remaining animals, used for controls, were inoculated but not irradiated. Effects of radiation were essentially negative, except that guinea pigs irradiated the day of inoculation exhibited acceleration of the disease in the form of ulcers and abscesses at the site of injection and regional lymphadenomegaly, although duration of life and extent of lesions at autopsy were not affected. Animals submitted to repeated irradiation prior to inoculation developed local evidences of the disease more slowly but showed no differences in the later stages of the disease.

Histologic findings were as follows: Slight increase of connective tissue at the site of irradiation; rarity of giant cells; presence of both caseous and proliferative forms of tubercles, and a proliferative hepatic cirrhosis.

The above findings offer by no means a complete answer to the clinical problems presented, for, admittedly, until a chronic tuberculous lymphadenopathy can be successfully produced in a laboratory animal, a carefully conducted evaluation of the results of roentgen therapy in this form of inflammatory disease cannot be made.

J. E. HABBE, M.D.

Phrenic Exeresis in the Treatment of Unilateral Pulmonary Tuberculosis. George M. Landau. Illinois Med. Jour., LX, November, 1931, 408-412.

This article is based on a ten-year experience as radiologist at the Cook County Tuberculosis Hospital, during which time, between 15,000 and 20,000 films have been studied.

If the results of operative procedures show that surgery has great value in the treatment of pulmonary tuberculosis, as an adjunct to sanatorium treatment, then there is every reason to justify the enthusiasm following the results of such treatment.

The writer says that if we can show by our records cases of clinical cure or arrest, such as the following, then this procedure must merit our attention. The patient, a physician without previous symptoms, had a severe hemoptysis, X-ray examination showing a large cavity in right lower lobe. Positive sputa and high temperature continued in spite of bed rest. Repeated X-ray examination revealed an increase in size of cavity and lower lobe mottling. Right phrenic extraction was done and immediate improvement noted, less sputa, drop in temperature and decrease in size of the cavity. In three months, a gain of 25 pounds in weight, normal temperature, negative sputa, absence of mottling, and practically complete obliteration of the cavity resulted.

In the program as carried out by Otto Schlack and Jerome Head, there has been no operative morbidity or mortality and no patient has been made worse by the treatment.

In conclusion the author states: "It is probably not within the province of the radiologist to draw conclusions or elucidate on the indications and contra-indications to phrenic exeresis other than those conclusions which he deduces from the roengenogram itself, but certainly after following such a series of studies of such cases as we have, one cannot help but conclude that in a disease as serious as pulmonary tuberculosis and in which such an agent as this has proved of such great therapeutic value, I do not see how one can escape the conclusion that this remedy should be applied as completely and effectually as possible, regardless of the fact that the patient may get well without it."

CHARLES H. DEWITT, M.D.

The Treatment of Tuberculosis of the Female Genital Organs. H. Martius. Strahlentherapie, Oct. 24, 1931, XLII, 471-484.

This is a detailed discussion of the author's indications concerning the treatment of tuberculosis of the female genital organs. Operation is contra-indicated if other organs, as, for instance, the lungs, are also involved. In some cases operation is necessary, because a diagnosis can be made definitely only after laparotomy. The use of small doses is urged in order to maintain the ovarian function. From 60 to 110 r are suggested as a single dose, the intervals and frequency of the treatments being adapted to the individual case. The exact mechanism of the effect is not definitely known. From the author's own statistics it appears that, of thirty-five cases treated during the years from 1917 to 1923, fifteen died, fifteen were cured, and five improved. Of twenty-two cases seen during the years from 1924 to 1930, one died, twelve were cured, five improved, and four have not healed so far.

ERNST A. POHLE, M.D., Ph.D.

Successful Radiotherapy of Two Cases of Pelvic-peritoneal Tuberculosis in Women. M. Mathey-Cornat. Bull. et Mém. de la Soc. de Radiol. Méd. de France, June, 1931, XIX, 297-300.

The first case, a female, 34 years of age, had "intestinal grippe," in March, 1930, with rapid pulse and fever from 38° to 40° C., lasting for ten days, with loss of appetite, asthenia, vomiting. In April, 1930, all symptoms subsided except fever, tenderness in the lower abdomen, diarrhea, and fetid feces, and anemia with leukorrhea. Examination showed an abdominal pelvic tumor mass of the uterus and adnexal masses, adherent, diagnosed as bilateral pyosalpinx, either of gonococcic or tuberculous origin. Laboratory tests for gonococci were negative. Two series of X-ray therapy in May and July, 1930, were given, totalling 1,600 and 2,000 roentgens, respectively, in divided dosage. The tumor receded in size, diarrhea ceased, and pelvic pain was less. The temperature became normal. Normal menstruation reappeared in January, 1931, and by May, 1931, she appeared perfectly well, with slight local tenderness in the lower abdomen only.

The second case, a female 26 years of age, began having irregular and excessive menstruation with pelvic pain, in March, 1926. She was hospitalized in October, 1926. In July, 1929, a sero-fibrinous pleurisy developed on the left side, requiring thoracentesis on two occasions. The fever ranged from 39° to 39.5° C. Pelvic examination revealed bilateral adnexal masses the size of two chestnuts, fixed, with a fibro-ascitic fluid in the left iliac fossa. In July, August, and September, 1929, three series of X-ray treatments were given, totalling 4,000 roentgens at each series through three portals of entry, each lateral port receiving 1,600 roentgens and the central port 800 roentgens, using 180 peak kilovolts (filtration not stated). By January, 1930, the uterus had become partly mobile, the adnexal masses had practically disappeared, and the fever had subsided. By August, 1930, all abdominal pain

had ceased. In May, 1931, no local signs could be found as sequelæ of the tuberculous pelvic peritonitis, and examination of the lungs was negative.

CHARLES S. CAPP, M.D.

The Treatment of Empyema. Carl A. Hedblom. Jour. Am. Med. Assn., Dec. 26, 1931, XCVII, 1943-1950.

Empyema may be classified as pyogenic and tuberculous, the pyogenic being subdivided into the acute and chronic; the tuberculous practically always becoming chronic.

The pneumococcus, streptococcus, and staphylococcus are the most common infective organisms in the order named. Empyema cavities vary greatly as to position and size. Bronchial fistulæ may result from rupture of a pulmonary abscess into the pleural cavity, or from perforation of an empyema into a bronchus.

Differentiation of types depends essentially on examination of smear and culture for pyogenic organisms. Treatment differs radically. The fundamental principle of treatment is drainage, instituted early, by a method that will not embarrass respiration or circulation and maintained until the cavity is obliterated.

Closed drainage is the method of choice in all early acute cases, in severely ill patients, and in infants. Rib resection and puş drainage is the alternative method and the method of choice in cases with large bronchial fistulæ.

Drainage is contra-indicated in sterile tuberculous empyema. Without associated pulmonary tuberculosis, air is substituted for the pus. With associated active pulmonary tuberculosis, pneumothorax is continued. If pus continues to form, a plastic obliteration of the cavity is brought about, as for the non-tuberculous type.

C. G. SUTHERLAND, M.D.

TUMORS (DIAGNOSIS)

Encephalography and Ventriculography. W. Löffler. Schweiz. med. Wchnschr., Aug. 29, 1931, LXI, 816-824.

Thirty-six cases have been studied, eight of which involved the region of the hypophysis. Of the four methods, direct puncture of the lateral ventricle and cisterna puncture are most used. The author injected a little air in an effort to produce a minimum of trauma. The technic is described.

Patients with extreme hydrocephalus, Parkinson's disease, and encephalitis lethargica stand the examination well, but untoward symptoms may arise in patients who have brain tumors. The author describes the complications. Good transient therapeutic results were obtained in some cases.

Seven cases of tumor of the hypophysis are reported. The findings are differentiated by Stenvers from those of hydrocephalus of the third ventricle by the more regular encroachment on the sella, seen in the hypophyseal tumors. The author found that the "regular" type of encroachment was common to four benign tumors, whereas in four malignant tumors there was an irregular enlargement of the sella with little or no hydrocephalus, but compression of the lateral and third ventricles.

H. C. OCHSNER, M.D.

Irradiation as a Means of Differentiating Certain Varieties of Tumors. A. U. Desjardins. Med. Clin. North America, November, 1930, XIV, 619-638. (Reprinted from "Cancer Review" by permission.)

The author points out that the radiologist can frequently distinguish between different tumors by the rate and extent of their regression after irradiation. In some cases, such as the lymphoblastomas and embryonic testicular carcinoma, this means of differentiation has proved to be nearly as accurate as histologic examination. He discusses, in addition to lymphoid and testicular tumors, bone tumors, and cites cases in support of his contention.

F. CAVERS, D.Sc.

Xanthomatosis (Schüller-Christian's Disease; Lipoid Histiocytosis). Merrill C. Sosman. Jour. Am. Med. Assn., Jan. 9, 1932, XCVIII, 110-117.

Xanthomatosis is a disease of lipoid metabolism in which storage tumors of lipoid appear in various places and in various organs, sometimes profoundly affecting the bodily health and welfare. There are five clinical entities included under this heading, namely, Gaucher's disease; Niemann-Pick's disease; Schüller-Christian's disease; the xanthomas occurring in icterus, diabetes, and pregnancy, and the so-called essential xanthomatosis.

Schüller-Christian's disease occurs chiefly in young children; it is characterized by involvement of the bones of the skull (occasionally other bones), with frequent association of diabetes insipidus, exophthalmos and gingivitis, less commonly dwarfism, adiposogenital dystrophy, and jaundice; it is not racial or familial, and is fatal in about one-third of the cases. Histopathologic studies have demonstrated that we are dealing with a phagocytic action of the reticuloendothelial system, which either removes an excess of lipoids from the tissues, or stores an excess of

lipoids in areas in which trauma or infection may have stimulated a collection of histiocytes. Chemical studies have proved that different lipoids are at fault in the different diseases. These cases are reviewed. Treatment includes diet and the administering of endocrine glands or their extracts. Schüller-Christian's disease is liable to spontaneous remission. Roentgenotherapy has given a uniformly beneficial result as far as local deposits in the bones are concerned. Recurrences may take place in the same place or in other bones.

C. G. SUTHERLAND, M.D.

Malignant Giant-cell Tumor of Radius with Recurrence and Metastasis: Report of a Case. H. Kokita. Chinese Med. Jour., January, 1932, XLVI, 64-68.

The author reports the case of a Chinese woman, 47 years of age, who presented a tumor of the right wrist of one year's duration. Physical examination revealed nothing of importance except the local condition. The tumor, which involved the distal third of the forearm, was firm and slightly tender on palpation. X-ray examination revealed bone destruction of the distal third of the radius, with expansion of the cortex. The expansion, however, was not symmetrical, as the radial side of the expanded shell remained intact and served as a connection between the undestroyed articular surface and shaft. At operation, the tumor was excised and a portion of the fibula transplanted. Pathologic examination of the specimen revealed a malignant giant-cell tumor, with no regularity in size and shape of the cells and with many mitotic figures.

Five months after operation the patient returned with a recurrent tumor. The growth was irregular in shape and had four firm prominences covered with shiny, tense, bluish-red skin which in places discharged a serosanguineous thin fluid. Roentgenograms revealed complete destruction of the distal third of the ulna and extensive destruction of the middle and remaining distal third of the radius. The bone graft was apparently not involved in this process. Metastases were found involving several ribs, both pleuræ, and the base of the right lung. The arm was amputated and the metastatic lesion involving one of the ribs was removed. The patient died several months later.

The author discusses the importance of considering the two different elements found present in giant-cell tumors. These are giant cells and the stroma. The characteristic feature of the tumor is the presence of numerous giant cells, which, however, play a very insignificant rôle when the question of malignancy is considered. The activity of the tumor depends primarily upon the stroma cells. In the majority of giant-cell tumors the stroma cells are mature, fibroblastic cells, which are uniform in size, spindle shaped, and contain no mitotic figures. These tumors are essentially benign. There is, however, a small number of cases which, though indistinguishable from benign giant-cell tumor clinically, roentgenologically, and according to their macroscopic morphology, show a significantly different microscopic picture. The difference here lies in the microscopic appearance of the stroma cells, for the giant cells are similar in appearance in these two types of tumors. In the malignant type, the stroma cells appear immature, irregular in size and shape, and show active mitosis, which is a definite indication of rapid growth and malignancy.

J. N. ANÉ, M.D.

The Triad of Symptoms in the Diagnosis of Intrathoracic Tumors. Guillermo Bosco. Rev. Med. Cubana, January, 1932, XLIII, 99-103.

The aim of this article is to point out the importance of a triad of symptoms which simplifies the diagnosis of intrathoracic neoplasms. Without this triad the internist relies on the roentgenologist for diagnosis when even the latter is unable to give a positive diagnosis. To help out in this difficulty the author offers the following triad of symptoms.

(1) *Thoracic Pain.*—According to the writer this sign has triple meaning and is a constant symptom. It is intense in character, constant, and radiating. This pain is so intense that even rest has no influence over it, being relieved by active medication only. Obviously, the relief lasts only while the medicinal effect endures. The pain, so intense that no other condition simulates it, is usually found anterior to the growth. The radiation has an almost localizing character. Lesions of the superior lobe radiate their pain to the head, neck, shoulder, and arm. Lesions of the middle lobe radiate their pain, together with lesions of the inferior lobe, along the thoracic wall. This is due to the fact that these lesions affect the intercostal nerves.

(2) *Homolateral Contortion.*—The author calls attention to a finding which he has observed in patients having intrathoracic tumors. This sign—a homolateral bending of the entire trunk toward the affected side—is best observed when the patient is in the upright position and all the clothing has been removed. Some patients may become conscious of this deformity and try to correct it while being examined. If this does not happen, the finding, which the author attributes to a muscular rigidity caused by the lesion, is quite constant.

(3) *Tumor Shadow on the X-ray Film.*—This shadow resembles that of any thoracic neoplasm. It is dense in consistency, irregular in shape (depending on its length of growth), with a sharp or hazy border. It is difficult and at times even impos-

sible to say whether it is benign or malignant. The author, through an original observation, claims that he can tell whether a growth is malignant or not. He combines a detailed history, a complete physical examination, and X-ray plates made at different angles. According to his observation, all malignant neoplasms adhere to the mediastinum. This sign is present, irrespective of the density, shape, or size of the neoplasm.

JOSEPH MALDONADO, M.D.

A Statistical Review of Tumors of the Locomotor Apparatus Observed in the Istituto Ortopedico Rizzoli during the Years 1929 and 1930. Giulio Faldini and Oscar Scaglietti. Riv. di radiol. e fisica med., December, 1931, IV, 179-199.

This review is of thirty-three cases of tumor seen in Rizzoli's institute during 1929 and 1930, which, according to the classification of Putti and Camurati, fall into the following groups: Tumors of the soft parts, three; osteogenic sarcomas, nine; giant-cell tumors, six; metastatic tumors, eleven; benign tumors, three, and myeloma, one.

Thirteen of these were diagnosed histologically, and the remaining twenty by clinical and radiographic data. Four of the metastatic tumors came from an undiscovered primary.

The clinical histories, the treatment, the radiologic and the pathologic findings in these cases are given in outline. The report is given to supplement the other studies of the material coming to the Institute.

E. T. LEDDY, M.D.

Pituitary Tumor Causing Trifacial Neuralgia. Eugene F. Bogen. Med. Bull. Veterans' Administration, November, 1931, VII, 1067-1069.

The author reports the case of an ex-service man, 35 years of age, who complained of neuralgia and nervousness of long standing. Physical examination of the patient revealed coarse features and a broadened nose. The hands were immediately noticeable because of their large size. The blood Wassermann and urine examinations were negative. A special examination of the eyes revealed cupping of the left optic disc. Stereoscopic roentgenographic examination of the skull showed erosion of the anterior and posterior horns of the clinoid processes and of the floor of the sella turcica. This was considered suggestive of brain tumor.

From the clinical and X-ray findings the diagnosis of acromegaly, due to pituitary gland tumor, and trifacial neuralgia, due to pressure of the tumor on the trifacial nerve, was made.

While trifacial neuralgia resulting from the pressure of a tumor on the trifacial nerve or its ganglion is not common in occurrence, the author believes that in cases of persistent trifacial neuralgia, in which no adequate local cause can be found, the possibility of a tumor producing pressure on the nerve or its ganglion should be considered and the patient referred for a radiologic examination.

J. N. ANÉ, M.D.

Sarcomatous Epulis Attributed to Irritation by Broken Nerve-extracting Needle. A. Catterina. Clin. Chir., November, 1930, XXXIII, 1292-1306. (Reprinted from "Cancer Review" by permission.)

A girl, 19 years of age, was treated for caries of a central upper incisor by a dentist who inserted a peg tooth. Ten months later a soft tumor was seen at the gingival border between the central incisors. X-ray examination showed that from the apex of the root, which was perforated by the metallic peg tooth, about 1 cm. of a nerve-extracting needle projected into the alveolus. The tumor was removed and found to be spindle-celled fibrosarcoma. Four months later there was recurrence; a second and more radical operation was performed, but the patient died three months after this, owing to orbital invasion and cerebral metastases.

F. CAVERS, D.Sc.

Malignant Adenomas of the Colon. E. J. Kilfoy. Am. Jour. Surg., August, 1931, XIII, 283-290. (Reprinted from "Cancer Review" by permission.)

The author discusses adenomas of the colon and reports an unusual case in which multiple adenomas of the large and small variety have undergone malignant changes. The polyps vary in size from a simple hyperplasia to tumors 5 or 6 cm. in diameter and with pedicles up to 6 cm. in length. Recurrence took place at the site of the old operation and about the colostomy opening, as a result of transplanted tissue from the Mikulicz resection and not removing enough of the colon. The tumor increased in spite of vigorous diet and X-ray treatment.

In a very large percentage of cases single adenomas are malignant, while in the multiple type they may become malignant if they increase in size sufficiently to undergo malignant changes. Adenomas occur most frequently in the large bowel. They occasionally are seen in the small bowel, and may be found throughout the gastro-intestinal tract. All adenomas are potentially malignant, and the type of operation and post-operative treatment should be left to the surgeon and to the nature of the individual cases. Adenomas in the colon and secondary implants in the abdominal wall are very resistant to

deep X-ray therapy. Malignant changes begin in the periphery of the larger polyps, rarely occurring in the smaller ones.

W. T. WARWICK, M.A.

Sarcoma of the Lacrimal Region in an Eleven-year-old Child. N. Puente Duany, A. Oteiza, and E. Fonts. Boletín de la Sociedad Cubana de Pediatría, June, 1931, III, 217-220.

This case is here presented because of its being so rare. A child eleven years old, four months previous to admission to the hospital, noticed a small nodule in the median angle of the right eye, which grew gradually without affecting the child in any visible way. On admission, the lesion was found to be about the size of a Brazil nut, ulcerative, painless, and firm, with a sero-sanguineous fluid and very sharp edges. A radiograph failed to reveal any bone changes around the lesion. At biopsy, the diagnosis of sarcoma was reaffirmed. Treatment consisted of X-ray therapy.

N. G. GONZALEZ, M.D.

Cerebral Tumor as a Cause of Generalized Epileptic Attacks of Long Standing. E. A. Blake Pritchard. Lancet, Oct. 17, 1931, CCXXI, 842-844.

The author presents five cases which show that it is possible for a cerebral tumor to give rise to generalized convulsions and to status epilepticus for many years before localizing signs are present. In general, such tumors are slow-growing and originate beneath the cerebral convolutions.

Epileptic attacks cannot be regarded as resulting from a rise in intracranial pressure, since, as shown in his cases, they may be present for many years before other signs of an increased intracranial pressure are manifest. Nor does an increase in intracranial pressure later increase the frequency of epileptic attacks.

Inference, from these considerations, is drawn that persons of middle age, who develop convulsions which occur repeatedly, should be regarded as possibly having an intracranial tumor and should be kept under repeated observation.

F. L. GRANDSTAFF, M.D.

Two Cases of Oligodendroglioma, with Remarks on the General Clinical Features of Such Cases. J. Purdon Martin. Brain, 1931, LIV, Part 3, p. 330-349.

The author reports two cases of oligodendroglioma in detail and also reviews a number of the cases which have been reported in the literature. He states that in 16 of the 19 cases reported in the literature, the tumor lay laterally in the cerebral hemisphere where it did not interfere directly with the circulation of the cerebrospinal fluid. Fourteen of these tumors were situated in the frontal or parietal lobes, and one each in the temporal and occipital lobes. In three cases the tumor lay across the midline of the brain and had no calcified deposits. All of the tumors which were situated laterally in the hemispheres contained sufficient calcium to be seen in the roentgenogram.

The author states further that the differential diagnosis of the nature of the tumor by means of the shadow is not possible because the calcareous deposits lie chiefly in the walls of the arteries and capillaries.

CORNELIUS G. DYKE, M.D.

Capillary Hemangioma of Cerebrum. W. G. Barnard and F. M. R. Walshe. Jour. Path. and Bacteriol., May, 1931, XXXIV, 385-387.

These tumors are so rare above the tentorium that eminent authorities doubted their existence. A case is here reported with post-mortem findings.

E. C. VOGT, M.D.

Necrotic Angioma. L. E. Pierini and P. Beranger. Rev. de Especial., October, 1930, V, 1411-1413. (Reprinted from "Cancer Review" by permission.)

An angiomatous tumor on the face of an eight-day-old infant showed areas of necrosis, with destruction of the skin over the cheeks, of the lobes of both ears, of the left nostril, and of the nasal septum. The authors administered salvarsan (though there were no signs of syphilis or other infection), methylene blue, and deep X-rays, but these were all unavailing.

F. CAVERS, D.Sc.

TUMORS (THERAPY)

Bladder Tumors: Clinical Manifestations. Report of Cases. Louis Clive Jacobs and Abelson Epsteen. Calif. and West. Med., September, 1931, XXXV, 207-212.

In the diagnosis of bladder tumors, the authors find that cystographic findings have not received the attention and importance they deserve. Cystoscopic inspection should and can be supplemented by cystography but can never be superseded by it. Cystograms should corroborate the cystoscope, but many times because of tumor mass, hemorrhage, vesical deformity, etc., the cystoscope is useless. Cysto-

grams give not only evidence of the size of the tumor but also knowledge of ureteral reflux with secondary ascending kidney infections and evidence of metastases of the bones. Where one finds general carcinomatosis, he will refrain from futile bladder surgery.

Under discussion of treatment, the authors cite fulguration, diathermy, radium, deep X-ray, and resection. They discuss all these various methods of treatment. While they have used radium and deep X-ray therapy on some patients, they are not able to see any brilliant results. In statistics compiled from fifty patients, they find they have five alive and free from symptoms at the end of four years. Of these, four were treated by surgical diathermy alone and one with diathermy and radium. Also, they have three patients treated by transurethral fulguration, in 1916, one of whom had a recurrence with metastasis after eight years. The other two are alive, although one had a recurrence three years ago and again one year ago; the other has had no recurrences. This article is illustrated with several cystograms.

FRANCIS B. SHELDON, M.D.

An Advanced Case of Nasopharyngeal Fibroma Treated by Diathermy Coagulation and X-rays. H. V. Forster. Jour. Laryngol. and Otol., June, 1931, XLVI, 402-404. (Reprinted from "Cancer Review" by permission.)

A male, aged 19, was found to have a large polypoid growth completely obstructing the left nasal passage. It bled very freely, even with slight interference, and there appeared to be no doubt but that the tumor was a nasopharyngeal fibroma. The tumor appeared to be invading the maxillary antrum.

A small dose of radium was given without any definite result. Three diathermy operations were then carried out, and as a result the tumor decreased in size. There was a tendency, however, to swelling of the left pharyngeal wall and left tonsil, and palpation suggested advance of the growth over the roof of the nasopharynx. Deep X-ray therapy was then administered and produced immediate improvement, which has been maintained up to the time of publication. Professor Regaud had expressed the opinion that nasopharyngeal fibromas were insensitive to radiation.

P. J. KERLEY, M.B.

Roentgenotherapy in Tumors of the Hypophysis. Karl Frik. Strahlentherapie, Oct. 24, 1931, XLII, 437-452.

The author reports six cases of hypophyseal tumor which were treated by roentgen rays. The first case was that of a man, 61 years of age, whose symptoms started two years before he came to the clinic. He had attacks similar to epilepsy, and suffered from loss of memory and insomnia. Besides, there were acromegaly, polydipsia, and polyuria as well as disturbances of the vision. Following two series of deep therapy the acromegaly remained stationary; he had no further attacks, much less headache, and there was considerable improvement of the polydipsia and polyuria. This improvement has lasted, so far, for one and one-half years.

The second case was that of a man, 38 years of age, whose symptoms had begun eighteen months before. He had headache, disturbance of vision, polyuria, and acromegaly. Already, after one series of treatments, he was so much improved that he could resume his work as a taxi driver. Six months later the headache recurred but disappeared following a second series. He has been well now for one year and five months.

The third case was that of a man, 47 years of age, whose symptoms dated back one-half year. He had symptoms in the eyes, headache, right amaurosis, left temporal hemianopsia. The pathology in the right eye could not be influenced and that in the left remained unchanged for a long time. The headache was, however, improved following the first series of treatments. Definite improvement in the left field of vision occurred recently, over two years following the treatment and after five series. The improvement still remains now, three and one-half years after the first exposure. The recurring headache could be eliminated by a sixth series of treatments, two and one-half years before the date of this report.

The fourth case was that of a man, 40 years of age, who had his first symptoms two years before the treatment. His principal disturbances were of vision and memory. Roentgenologically a hypophyseal tumor could be demonstrated. Biopsy showed adenoma. Four weeks after the first series of treatments he could resume his duties as a police sergeant. The improvement lasted for one-half a year, during which time a second series was given. Headache, vertigo, and disturbances of the vision could be improved by a third series, and the patient has remained able to work for one year and three months.

The fifth case, a man, 39 years of age, had symptoms for a year and a half, with a preponderance of disturbances of the vision. Roentgenologically, there was a large hypophyseal tumor, with destruction of the neighboring tissue. Biopsy showed adenoma. After one series of treatments there was considerable improvement and after a second series the patient resumed his work and has been well now for two years.

The sixth case was that of a woman, 65 years of age, with symptoms for only three months. The chief complaint was that of loss of eyesight. This

was accompanied by loss of hair and diabetes insipidus. Roentgenotherapy led to a clinical cure which has lasted now for two years. Deep therapy radiation was used (178 K.V., 6 ma., 0.6 mm. Cu, 6 × 8 sq. cm. field, 40 cm. F.S.D.) Four fields were usually exposed, two temporal, one frontal, and one occipital, sometimes also a parietal area. The average dose per field was 75 per cent H.E.D. Slight changes in the technic were made, according to the requirements of the individual case.

From his observations, the author concludes that radiation therapy should be regarded as the method of choice in cases with hypophyseal tumors. If there is no response following the first series, treatment should not be discontinued unless there is a vital indication for operation. Caution is indicated in prescribing the dose, fractional irradiation being preferable.

ERNST A. POHLE, M.D., Ph.D.

Laryngeal Fibrosarcoma. Deep X-ray Treatment: Five-year Cure. V. Texier. Ann. Mal. Oreille, August, 1930, XLIX, 823, 824. (Reprinted from "Cancer Review" by permission.)

The patient was a man, 77 years of age, who had for five years been hoarse and lately almost voiceless. A small, smooth tumor sessile on the right cord, which was thickened and infiltrated, was removed almost completely and found to be a fibrosarcoma with large spindle cells. The treatment was given in seventeen sittings of one hour each; 2 ma., 25 cm. distance, 15 mm. Al (dosage not stated). After more than five years of freedom from recurrence, the patient died from enteritis.

F. CAVERS, D.Sc.

ULCERS (ETIOLOGY)

Ulcers of the Rectum and Sigmoid. The Differentiation of Tuberculous Ulcers from Amebic Ulcers, and Chronic Ulcerative Colitis. Clement L. Martin. Jour. Am. Med. Assn., Jan. 2, 1932, XCVIII, 27-31.

Outside of institutions for the tuberculous, tuberculous ulcers of the rectum and sigmoid are infrequently observed. Even in institutional patients they are uncommon, except in those with far-advanced disease. Chronic ulcerative colitis and amebiasis with ulceration are the more common lesions seen in ordinary practice. The proctoscopic differentiation of tuberculous ulcer, chronic ulcerative colitis, and amebic ulcers is given in detail. One case is reported in which pulmonary tuberculosis and chronic ulcerative colitis were co-existent.

A negative roentgenogram of the chest and the absence of positive lung findings exclude tuberculosis in the etiology of multiple ulcers in the rectum and sigmoid.

C. G. SUTHERLAND, M.D.

A Case of Post-operative Gastroduodenal Ulcer Treated Medically, with a Clinical and Radiologic Cure. Dino Agati. Archivio di Radiologia, May-June, 1931, VII, 509-524.

In a case of pyloric stenosis which had had a posterior gastro-enterostomy by the method of V. Hacker, the author found the complete clinical and radiologic findings of secondary gastroduodenal ulcer. The patient was treated medically and ten months later he was completely cured. The niche and the other direct and indirect signs of ulcer had disappeared.

E. T. LEDDY, M.D.

Diagnosis of Peptic Ulcers. Sam A. Overstreet. Kentucky Med. Jour., August, 1931, XXIX, 394-396.

Out of 407 patients with stomach complaints, on X-ray examination, 67 showed peptic ulcer. In very many cases the X-ray examination indicated lesions in other organs, and the exclusion of peptic ulcer is frequently just as valuable a discovery as finding one.

W. W. WATKINS, M.D.

ULTRA-VIOLET LIGHT

Contribution to the Study of the Path of Penetration of the Anti-rachitic Influence of Ultra-violet Rays on the Organism. Gino Frontali. La Radiologia Medica, November, 1930, XVII, 1316-1333.

In order to establish whether or not the curative and preventive action of ultra-violet rays takes place through the inhalation of irradiated air or through direct exposure of the skin, the author selected three groups of albino rats, fed according to McCollum's diet No. 3,143 and submitted to the following living conditions: The first group was allowed to breathe temporarily irradiated air, from 5 to 120 minutes, in glass vessels from which they were removed without having been directly exposed to the rays; the second group was submitted to direct ultra-violet treatment and inhalation of irradiated air was totally excluded; the third group was given no ultra-violet treatment of any sort. Results were founded on radiologic, histologic, and general examinations.

The author concludes that ultra-violet rays act in a preventive and curative way, even in the absence of inhalation of irradiated air, and that breathing of the latter exclusively is not followed by any anti-rachitic action, either preventively or curatively.

L. MARINELLI.

The Relation between Ergosterol and Carotene. H. von Euler and B. Jansson. Arkiv. Kemi. Min. Geol., 1931, XB, 1-6.

A comparison is made of the oxidation (color removal) of carotene, pure and mixed, with ergosterol, in the dark and in the presence of visible and ultra-violet light. No change in color occurs in the dark but loss of color is noticeable in all exposed solutions. The sensitization of ergosterol occurs in the presence of carotene, as if the latter acted as a "sensitibility agent." Peptone, casein, and other colloidal matter which absorb ultra-violet light influence the activity of ergosterol. A brief study is included of the n of preparations of α- and β-carotene and of xanthophyll.

CHEMICAL ABSTRACTS.

Several Radio-biological Problems of the Skin. Nicola Lovisatti. Fortschr. a. d. Geb. d. Röntgenstrahlen, 1931, XLIV, 235-240.

A brief account is given of the habituation of the skin to ultra-violet and light rays, the meaning of the melanotic pigments and the antagonism between ultra-violet and infra-red rays.

CHEMICAL ABSTRACTS.

Inhibition of Growth *in Vitro* of Neoplastic Tissue by Methylene Blue Sensitized by Exposure to Ultra-violet Light. A. H. Roffo. Bol. Inst. Med. Exp., December, 1930, VII, 950-969. (Reprinted from "Cancer Review" by permission.)

Previous experiments having suggested that in malignant growth the normal oxidation-reduction relation is disturbed, the author experimented with methylene blue in order to ascertain the influence of an oxidizing agent on this relation. His experiments were made with cultures of chick embryo heart muscle and spindle-celled rat sarcoma. In each case one series of cultures was exposed to ultra-violet light before being incubated; a second was grown in plasma containing methylene blue; a third in methylene blue, but also exposed to ultra-violet rays (the effect of which is to sensitize, or accelerate the action of methylene blue), and a fourth served as controls. In the culture containing methylene blue and exposed to ultra-violet rays, there was total inhibition of growth, but normal growth occurred in the media treated with methylene blue alone or ultra-violet rays alone.

The conclusion is drawn that the inhibition was due to the oxidizing properties of the sensitized methylene blue.

F. CAVERS, D.Sc.

The Effect of Roentgen Rays on Cholesterol Metabolism. H. Hoehne. Arch. Gynäkol., 1931, CXLVI, 41-50.

In twenty-three of twenty-five instances carcinoma patients after irradiation with X-rays showed a decrease in cholesterol in the blood serum and carcinoma-free patients an increase in cholesterol. The two atypical cases in which carcinoma-free patients gave a decrease in cholesterol were a case with severe inflammatory conditions and a case in which a carcinoma of the uterus had been removed by operation some months before without recurrence. X-rays of relatively long wave length had more effect on the cholesterol content than those of relatively short wave length.

CHEMICAL ABSTRACTS.

The Effect of Ultra-violet Rays on Cholesterol Metabolism. R. Hubert. Arch. Gynäkol., 1931, CXLVI, 51-61.

In general, after irradiation with ultra-violet light, carcinoma patients showed a decrease in cholesterol in the blood serum and carcinoma-free patients an increase or no change in cholesterol. The exceptions among the carcinoma-free patients who showed a decrease in cholesterol in the blood serum were women who had acute inflammatory diseases, had highly pigmented skin, or were pregnant, though not all pregnant women reacted atypically.

CHEMICAL ABSTRACTS.

NOT OTHERWISE CLASSIFIED

Malignant Conditions in Radio-active Persons. Editorial. Jour. Am. Med. Assn., Dec. 26, 1931, XCVII, 1968, 1969.

Martland, in 1925, reported cases of anemia and of necrosis of the jaw in persons employed in painting watch dials with paint made luminous by the addition of radium, mesothorium, and radiothorium.

Another pathologic condition seems to have arisen among the employees who swallowed radio-active paint. Since 1928, rapidly growing sarcomas have appeared in at least eight cases. In the early cases, mesothorium, which is physiologically more active than radium, predominated, but enough time has elapsed since their exposure to allow the mesothorium to diminish in quantity by its own natural decay to below half its former strength. In the late cases which have resulted fatally, only radium has been detected and this has accumulated in the bony skeleton. Destructive bombardment in the bones produces pathologic changes, giving rise to an anemia and to radiation osteitis; in these areas sarcomas later arise.

Many of the radio-active substances sold to the public may be dangerous to health. The drinking of radio-active waters, containing radon, over long periods of time should be discouraged. Martland likewise cautions against the intravenous injection of long-lived radio-active elements.

C. G. SUTHERLAND, M.D.

Radio-active Spring at Brambach. F. W. Petersson. Verkehr. Bäder, 1929, No. 10; Ztschr. wiss. Baderk., 1930, IV, 563; Wasser u. Abwasser, XXVII, 228.

The water actually contains a small quantity of the element Ra itself besides much CO_2. The water possesses properties which appear to benefit gastric and intestinal disorders, metabolism disturbances, and other ills.

CHEMICAL ABSTRACTS.

Focal Infection. Duncan Graham. Canadian Med. Assn. Jour., October, 1931, XXV, 422-424.

A large percentage of the patients one sees in both hospitals and consultations suffering from subacute or chronic disease give a history of earlier treatment for the removal of foci of infection. While it is true that many of them have been definitely helped, one is impressed by the fact that the removal of a focus or foci of infection has resulted only too often in little or no improvement in the general health of the patient. Occasionally his disability has been increased. The chief reasons for this are: (1) An inadequate appreciation of the causal relation of focal infection to various chronic conditions; (2) an incomplete diagnosis, and, therefore, an incomplete plan of treatment for the individual patient; (3) a lack of co-operation in both diagnosis and treatment between the physician in charge of the patient and the medical or dental specialist who removes the foci; (4) an inadequate follow-up of patients under treatment.

The author discusses the subject from these four standpoints and urges co-operation between the attending physician and the specialist in the examination of the eye, ear, nose, and throat, the gums and teeth, and in the interpretation of X-ray findings, in making a complete diagnosis and outlining a complete treatment.

Simply finding a focus of infection and removing it is not sufficient. By the time a patient consults his physician the effects of a focal infection are seldom restricted to the focus itself. In the treatment of a patient with a badly infected tooth or tonsil, it is not simply a question of its removal. A more important question is the possible existence of systemic disease or metastatic infection, either the result of the focus or co-existent with it. The specialist should call in the physician and the two should co-operate in the search for all the avenues of disease. Only the combined treatment of all the phases of the disease in the individual patient can bring satisfactory results. And only the careful follow-up of the patient can guard against future ill-results not possible of anticipation at the time of the original treatment. An incomplete recovery is always an indication that some avenue of disease has been unexplored at the original date of treatment, and reinvestigation is required.

L. J. CARTER, M.D.

How We can Meet the Cancer Problem. Henry J. Ullmann. Am. Jour. Roentgenol. and Rad. Ther., November, 1931, XXVI, 726-728.

The hopelessness with which many people, both among the medical profession and the laity, consider the entire cancer problem should be actively combated, first, because the number of cures is definitely although slowly increasing, and second, because much more than the mere administration of morphine can be done to afford a variable period of relief for cases beyond the possibility of cure. A panacea or specific cure is being eagerly sought by many, but in the opinion of the author it is unlikely that a specific one, applicable to all forms of malignancy, will ever be found.

At the present time, at least, monies made available for cancer work should be devoted to the organizing of the members of the profession in all localities for the early and accurate diagnosis of the disease. Elaborate and costly facilities for most effective therapy should be for the present mobilized in the larger centers where research activities would also be carried on. Continuous effort along the latter line is very essential, but in the meantime every facility for either cure or amelioration should be available to those actively suffering from the disease.

J. E. HABBE, M.D.

Roentgenologic Studies at the Bedside. Walter H. Ude. Journal-Lancet, Aug. 15, 1931, LI, 521-528.

While bedside roentgenographic work finds its widest application in the study of the bony framework in connection with fractures, the method has other uses also. Very satisfactory chest films can be made, though fine detail is lost because of time of exposure required; but in cases of pneumonia, pleural effusion, or post-operative complications, it is very valuable. Bedside films of the abdomen may be of great help, especially where bowel obstruction is suspected. Several other types of lesions can often be advantageously examined with the bedside unit.

W. W. Watkins, M.D.

Blood Cultures and Focal Infections: An Experimental Study with One Hundred Healthy Adults. Gordon C. Cameron, C. A. Rae, and George N. Murphy. Canadian Med. Assn. Jour., August, 1931, XXV, 131-134.

The fact that the blood stream of the healthy animal is normally free of bacteria is such a fundamental in our conception of infection that we accept it with little more than a passing thought. It is noteworthy, however, that records of studies to establish this fact are very difficult to find. Our assumption is based upon the fact that in ordinary practice we obtain many negative cultures of blood and when we do encounter positive cultures they are usually of serious import. There is much evidence, however, to indicate that pathogenic organisms do invade the blood stream without necessarily indicating disaster and without the production of significant symptoms. It is felt that one of the most definite indications of this is the frequent occurrence of osteomyelitis of a suppurative type from which staphylococci are obtained and which could result only from hematogenous infection. Also, the not infrequent experience of finding staphylococci or similar micrococci in blood cultures in hospital laboratory practice leaves one in doubt as to whether these organisms are contaminants or potential pathogens. Then, too, one encounters other organisms variously described as "diphtheroids" and "pleomorphic non-hemolytic streptococci," which do not incite disease of serious import.

In view of these considerations it was felt that information might be obtained by performing blood cultures on a large group of persons in good health. This report, therefore, conveys the findings of such an experiment carried out upon 100 students of the Faculty of Dentistry, University of Toronto, who volunteered to submit themselves for blood culture. These subjects were all young men between the ages of 20 and 26 years. An interrogation regarding the present health and previous experience of disease was conducted and an inspection of the nose, throat, and ears of each was carried out, as well as a detailed examination of the teeth, which included X-ray examination of the full mouth. Complete physical examinations were not made, as it was felt that they would be superfluous in view of the uniformly good histories.

For the sake of uniformity in the investigation, the culture medium was all pooled before its final titration, and the blood cultures, and ear, nose, and throat inspections were all performed on the same day. The technic employed is given in detail.

The results were as follows: Of 100 cultures, 81 remained negative. The discussion must center about the remaining nineteen. Twelve of these were indisputably contaminants. The organism was, in all cases, a spore-forming bacillus. Of the remaining seven, one was evidently an air-borne contaminant. Of the six positive cultures, four were characteristic *Staphylococcus aureus*. The other two were diphtheroids.

With a view to investigating whether or not those who yielded positive cultures were constant harborers of organisms in their blood streams, new cultures were made about six weeks after the first. These second cultures all remained negative for a month.

Regarding dental examination, there were 25 cases in which the X-ray revealed apical disease in from one to four teeth. These 25 cases all gave negative cultures. None of the six with positive blood cultures showed any tooth abnormality.

Regarding the ear, nose, and throat examinations, there were only 18 cases free of some evidence of inflammation. In only two were the ears involved, and they showed chronic suppurative disease of the middle ear or mastoid cells. One case with a positive culture had a muco-purulent discharge from the nose.

L. J. Carter, M.D.

Personal Experiences with Pyelography. C. F. Heider. Nebraska St. Med. Jour., October, 1931, XVI, 385-389.

This paper aims to impress on the general practitioner the importance of the pyelogram and ureterogram in the diagnosis of lesions of the upper urinary tract. During the pioneering days of pyelography, there were many accidents and some deaths. With the development of proper technic, there is now little danger, and contra-indications to the procedure are few, acute infection and marked renal insufficiency being the main ones. The technic of retrograde pyelography and intravenous urography are given, and slides showing a variety of lesions are reproduced as illustrations in the article.

W. W. Watkins, M.D.

The Etiopathogenesis of Ossifications in Operative Scars. E. Ruggieri. L'Ateneo Parmense (Suppl.), 1931, III, 84-107.

The author reports a case of ossification of a scar from laparotomy, which he studied clinically and radiologically. The radiologic examination brought into evidence a niche corresponding to the pylorus on the incline of the lesser curvature, but revealed no signs of neostomy. The radiographs, taken along the anteroposterior axis, showed no manifestations referable to a hard formation of the scar.

Cases of this nature are by no means infrequent, and from the literature on the subject and from his own case the author formulates the following conclusions:

(1) Ossifications of surgical scars, like practically all other heterotopic ossifications, are manifestations of a metaplasia of the connective tissue.

(2) There is no specific etiologic agent present.

(3) The connective metaplasia is based on a defect in local circulation and on the presence, in the immediate neighborhood, of a calcareous deposit which acts simultaneously as a metaplastic stimulus and as material for induration.

(4) The predilection of post-operative ossifications for the median xipho-umbilical abdominal tract seems due to the natural scarcity of the local blood supply.

W. W. Whitelock, Ph.D.

Roentgen Diagrams of Human Tissues and Concrements. E. Saupe. Fortschr. a. d. Geb. d. Röntgenstr., August, 1931, XLIV, 204-211.

This is a brief review of the most important publications on the subject, showing reproductions of diagrams of several tissues and concrements.

Roentgendiagraphy is used to investigate the molecular structure of tissues (substances in general), thus reaching beyond the limits of microscopy (spectral analysis and crystallography).

Hans A. Jarre, M.D.

CHEMICAL ABSTRACTS

Ultra-violet Irradiation and Catalase. Hans Koeppe. Arch. f. Kinderh., 1929-1930, LXXXIX, 1-72.

I. *The Decomposition of Hydrogen Peroxide by Blood.*—The author studied the liberation of O_2 from H_2O_2 by blood catalase, varying the quantities used, and measuring the O_2 set free and the rates of liberation under different conditions. He found that a definite amount of blood, with a definite catalase content, has a definite H_2O_2-decomposing power or energy. This energy can accomplish a definite amount of work. The time required varies with the intensity and the resistance to be overcome. The energy is exhausted in time, converted into work.

II. *The Decomposition of Hydrogen Peroxide by Ultra-violet Irradiation.*—Using a similar closed system for measuring O_2 set free from H_2O_2, the author found that iradiation with ultra-violet light liberates O_2. With equal intensities of irradiation, the amounts of O_2 set free are the same, for unit periods. Consequently, by standardizing the cell containing H_2O_2, and by using a standard strong solution, it is possible to measure the intensity of radiation of the quartz lamp.

III. *The Decomposition of Hydrogen Peroxide by Heat.*—Heating of H_2O_2 liberates O_2. Gas bubbles appear at 50°, and the maximum effect is between 60° and 70°. With the quartz lamp the highest temperatures found were from 43° to 45°. Much higher temperatures were found with other types of lamps. It is necessary to exclude the effect of heat in estimating the intensity of radiation by the H_2O_2 method.

IV. *The Function of Catalase.*—Catalase takes the O_2 from the oxyhemoglobin of the blood, and unites it to the fatty envelope of the red blood cell. In other words, oxyhemoglobin is reduced by the action of catalase, while the fatty envelope is oxidized.

V. *The Force Effecting the Decomposition of Hydrogen Peroxide.*—The author recognizes the oxidative potentialities of ultra-violet light, and thinks that catalase may be a storehouse or accumulator for radiant energy. Investigations on the catalase of blood and milk indicate that catalase belongs, in the widest sense, to the group of materials essential for life.

Chemical Abstracts.

PHYSICAL ABSTRACTS

A New Application of the Differential Filter Method for the Production of Monochromatic Roentgen Rays. Hans Küstner. Ztschr. f. Physik, 1931, LXX, 468-491.

The author has suggested a method to produce monochromatic roentgen rays by using the secondary radiation produced by roentgen rays in certain selected substances. By employing the same filter in the direct roentgen beam and then in the secondary radiation beam the difference of intensity measured gives the relatively strong characteristic radiation of the beam of the secondary radiation. The two alpha lines can be separated by placing a selectively absorbing filter into the beam of the secondary radiation. By this method monochromatic rays can be produced in the range between 2.5 and 0.128 Å. units. Several important applications of this method are presented.

Otto Glasser, Ph.D.

The Grating Constant of Calcite Crystals. J. A. Bearden. Phys. Rev., Dec. 15, 1931, XXXVIII, 2089-2098.

The precise methods of measuring X-ray wave lengths, now in use, raise two important questions concerning the crystal grating used. First, what variation in the grating constant is to be expected for crystals grown under different conditions? Second, what is the most accurate value of the grating constant? Since calcite crystals are the most used crystals in X-ray spectroscopy, the present work was undertaken to answer as well as possible the above questions for this crystal. The variations in the grating constants of six calcite crystals from four sources (Iceland, Montana, Argentina, and Spain) have been determined by measuring the angle of diffraction for the molybdenum $K\alpha_1$ line in the fourth order. A high precision 2-crystal spectrometer was used for measuring the diffraction angles. The results are given in the table below. The density of these crystals was then carefully determined. From six to nine independent determinations were made at a temperature of $20.00 \pm 0.01°$ C. The averages of these values are given for a temperature of 20.00° C., in the fourth column of the table. The probable error determined by the method of least squares is given in the fifth column. The mass of the crystals used in determining the density is given in the sixth column. Considering the density measurements of DeFoe and Compton, the writer gives the density ρ in g./cm.$^{-3}$ at 20° C. as $\rho = 2.71030 \pm 0.00003$. The crystals were then chemically analyzed. The results showed that all samples contained about 0.01 per cent ferrous oxide, 0.01 per cent manganous oxide, and 99.98 per cent calcium carbonate. The angle between the cleavage faces of the calcite crystals was determined by three methods. X-rays were used for determining the angle in the first two methods and an optical method for the third. The results for 20° C. were $\alpha = 105° 3' 29''$ or $\beta = 101° 54' 4''$, where α is the interior obtuse dihedral angle, and β the angle between the edges of the crystal. The grating constant of the crystal can be calculated from the equation $d = (nM/\rho N\phi)^{1/3} = 3.02816$ Å. at 20° C., $= 3.002810$ Å. at 18° C. The values of the constants used were, $n = 1/2$, $M = 100.078$, $\rho = 2.71030$, $N = 6.0669 \times 10^{23}$, $\phi = 1.09594$.

Origin	Diffraction angle θ	Difference from mean	Density g./cm.$^{-3}$	Probable error	Mass of crystals g.
Iceland	27° 51′ 34.0″	—0.4″	2.7104	±0.000021	12.9764
Iceland	27° 51′ 34.0″	—0.4″	2.71035	±0.000015	15.5780
Montana	27° 51′ 34.6″	+0.2″	2.7102	±0.000081	7.1467
Montana	27° 51′ 34.7″	+0.3″	2.7102	±0.000024	14.8650
Argentina	27° 51′ 34.7″	+0.3″	2.7102	±0.000042	11.0769
Spain	27° 51′ 34.4″	0.0″	2.7102	±0.000036	13.0083
Mean	27° 51′ 34.4″		2.71026		

THE AUTHOR.

The Photographic Action of the Electrons Released by X-rays. K. Schocken and L. Grebe. Phot. Korr., 1931, LXVII, 21-23.

It is known that an intensification of the action of X-rays may be brought about by placing a thin sheet of metal over the photographic film. This is due to liberation of secondary electrons. With thin sheets of Al, Cu, and Pb, and Zeiss Ikon film from a film pack, the authors have found that the electron action increases with increasing frequency of the rays. An experiment in which a thin plate of celluloid was interposed showed that the scattered X-rays and the characteristic rays produced have only a slight action as compared with the electrons.

CHEMICAL ABSTRACTS.

The Scattering of X-rays by Polyatomic Gases. Y. H. Woo. Phys. Rev., Feb. 15, 1932, XXXIX, 555-560.

Recently, Jauncey has shown that the factor F, in Compton's formula for the scattering of X-rays by an atom, should be the average atomic structure factor F', instead of the true atomic structure factor. Taking this into account, the general expression for the intensity of total scattering of X-rays by polyatomic gases previously deduced by the writer is modified, replacing F by F'. The theory is applied to the scattering of X-rays by diatomic gases and the theoretic scattered intensity is actually compared with the absolute measurements made by Wollan on the scattering of Mo $K\alpha$ rays by H_2, N_2, and O_2. The values of F and F' are calculated from the Hartree field. On the whole, Wollan's results support the new formula, though the old one represents in each case the general feature of the scattering curve. It is pointed out that, for the scattering by a diatomic gas of like atoms, Jauncey's theory of the scattering of X-rays by polyatomic molecules consisting of atoms of one kind gives results practically identical with those of the present theory, provided the change of wave length due to the Compton effect is corrected for.

THE AUTHOR.

The Absolute Determination of the r-unit in the Range of Radium Rays. Erich Albrecht. Strahlentherapie, Oct. 3, 1931, XLII, 328-336.

The author discusses first the general principles of a large barrel ionization chamber and its possible use for the measurement of gamma-rays in r. Wall material is only equivalent to air for this purpose, if the same number of photo and Compton electrons are produced and if these electrons are absorbed exactly as in air. Measurements in the gamma-ray region with the large chamber are dependent upon its diameter and also upon its length. As far as the wall material is concerned, it must have a very definite thickness which has to be determined experimentally for each material. This is of great importance in the standardization with radium according to Solomon's method. Comparative measurements by means of chambers with improper wall thickness will lead to erroneous results. Small ionization chambers can be calibrated against large barrel chambers of proper construction and the isodoses for radium preparations then determined in r.

ERNST A. POHLE, M.D., Ph.D.

The Demonstration and the Intensity of the Mitogenetic Radiation.—I. H. Schreiber and W. Friedrich. Biochem. Ztschr., 1930, CCXXVII, 386-400.

In an attempt to find a physical detector for the mitogenetic radiation, the authors studied the effect from cultures of *Sacchatomyces ellipsoideus* with the photo-electric method, using the Elster and Geitel charging method and registering the string deflections of an electrometer with a photographic arrangement. In twenty-six experiments no positive effect could be detected. The authors call attention to the difficulties in interpreting the results obtained with biological detectors of mitogenetic radiation, and feel that the methods of using various ranges of the spectrum of artificial light sources to produce mitogenetic effects similar to those produced by tissue have led to erroneous conclusions. There are numerous discrepancies in the mitogenetic literature and it seems desirable to carefully go over the reports in order to possibly find and remove sources of error in the various measurements reported.

OTTO GLASSER, Ph.D.

Photo-electric Cells. Vereinigte Telephon- und Telegraphenfabriks. A.-G. Czeija, Nissl and Co. Austrian patent 124,891, May 15, 1931.

To deposit an active layer of alkali metal inside the cell, the latter is immersed in a bath of fused alkali metal salt, and is also partly filled with the fused salt. Electrolysis is then effected so as to cause metal ions to pass from the salt inside the cell into the glass wall of the cell, and the salt in the cell is then removed, the cell replaced in the bath, and electrolysis effected in the reverse direction, so as to drive the alkali metal to the inner surface of the cell. A filament in the cell may act as electrode in the second electrolysis, and prior thereto, the cell may be evacuated and may also be coated inside with Mg by vaporization.

CHEMICAL ABSTRACTS.

The Distribution of Radio-active Substances in the Air. Josef Priebsch. Physik. Ztschr., 1931, XXXII, 622-629.

An error is found in previous calculations of the distribution in the air of radio-active substances from the earth, which were made by Schmidt and apparently confirmed by the observations of E. Schmid (*Wien. Sitzber.*, 1931, IIA, 27-48). The author points out that the observations of Schmid were made in the Graz basin where abnormal air conditions exist. The author also thinks Schmidt assumes too quick a decrease of radio-activity with height and makes new calculations. He obtains values between those of Schmidt and the earlier values of Schmidt and Hess.

CHEMICAL ABSTRACTS.

Shadow Photography by, and the Longitudinal Scattering of, Radiant Heat. I. Plotnikov. Phot. Korr., 1931, LXVII, 6-10.

In radiography by means of red or infra-red rays with any considerable thickness of material, there is often troublesome scattering; this is considered to be connected with reversible transformations in complex molecules. The periodic variation in the scattering of near ultra-violet radiation by pure water, sugar solution, etc., is also described.

CHEMICAL ABSTRACTS.

A Heating Arrangement for X-ray Samples. G. Wassermann. Metallwirtschaft, 1931, X, 922, 923.

Disadvantages of other methods are overcome by heating the sample in the stream of an inert gas which has been heated outside of the X-ray apparatus. The sample is mounted vertically in a small porcelain tube, and the gas flows from a cylinder through a furnace and then through a short movable glass tube at right angles to the sample. On the opposite side of the sample, another glass tube of larger diameter is mounted, through which the gas is removed by suction. The distance of the two

glass tubes from the sample can be closely adjusted. The thermocouple for determining the temperature of the sample is placed in the exit tube. Advantages of this method are accessibility of the sample by moving the glass tubes, adjustment of the temperature by varying the gas pressure, and accuracy of temperature measurement.

CHEMICAL ABSTRACTS.

Variation in the Effective Lattice Constant of Crystals with Wave Lengths. J. M. Cork. Phys. Rev., Jan. 15, 1932, XXXIX, 193-196.

This investigation is carried out to determine to what extent X-ray wave lengths determined by a calcite crystal are consistent over a considerable wave length range where the refractive index is known to vary. To this end the reflection angles for particular emission wave lengths up to 5.5 Å. are observed using a quartz crystal. These angles are combined with corresponding values obtained with calcite. The values for log (λ (calcite)/2 sin θ (quartz)) when plotted with wave length, assuming $(1-\mu)/\sin^2\theta$ constant for quartz, result in a curve showing the variation due to calcite. A discontinuity exists at the wave length of the *K* absorption edge for calcium. The nature of the curve is in agreement with a similar one obtained by Larsen from measurements of the index of refraction. The discontinuity is in the sense to be expected from the dispersion theories of Kallmann and Mark and Kronig. Assuming quartz as ideal in the range of from one to five Ångströms, measurements with a calcite crystal are not inconsistent by as much as one-third of one-tenth of a per cent.

THE AUTHOR.

Experiments on a Lenard-Coolidge Tube. Wolfgang Gentner. Ann. d. Physik, 1931, X, 223-243.

A cathode ray tube of the Müller Company, in Hamburg, which was continually connected to the evacuating pumps, was used on the valve tube apparatus producing 210 K.V. and 4 milliamperes. A broad spectrum of electron velocities was found which is due to the pulsating tension and to the velocity changes in the tube window. The determination of the practical range of cathode rays in aluminium showed a continuous change from slow to very fast cathode rays. In addition to the cathode radiation a very intense roentgen radiation was observed at the tube window. By means of a coil through which a current could be sent the intensity of the cathode-ray beam was concentrated to several times its original value while the roentgen-ray intensity was not changed by this arrangement. The effect of the cathode rays upon a number of materials was studied.

OTTO GLASSER, Ph.D.

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